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The Line of Advance in the Coal Field

By David Moffat Myers

FOR every person directly interested in fuel conservation in connection with industrial and railroad consumption, there are one hundred who are vitally concerned in the field of heating and ventilation. Two hundred thousand industrial plants, including railroads, against twenty million families whose homes, and hotels and office buildings require suitable and economical heating and ventilating. Here, therefore, is a personal and popular interest in fuel conservation, with an urge toward progress which is not, I feel, always appreciated. The backing of the people at large can be counted upon by the engineers who will lead the way and blaze the trail toward better methods and more efficient equipment in this field.

When I think of coal I think of conservation. This does not mean curtailing the useful results of coal. But it does mean burning it more efficiently, absorbing a maximum of its heat, and applying this heat with a minimum of waste. Thus less fuel will be required for a given result.

Great progress has been accomplished in the last few years, and more engineers and inventors and business men are now engaged in this problem than ever before. It is largely owing to improvement in equipment and method that fuel-oil in many localities has become a competitor of coal. This is a good thing, for it not only makes available an additional fuel at periods of possible shortage of other fuels, but also results in an increased activity on the part of the coal advocates to defend and improve their own apparatus and modes of operation.

A notable advance brought about by improved equipment, both in the power and heating fields, has been the effective utilization of the fine sizes of anthracite coal, much of which had been formerly regarded as a waste product of mining, and you will find within these pages a record of recent progress in applying the small and cheaper anthracites to house heating.

In the course of time, depending upon when it shall become economically feasible, we shall have carbonized smokeless house fuel as a result of the processing of bituminous coal.

The war emergency taught thousands of householders that soft coal could be burned in their furnaces when necessity demanded. The A.S.M.E. and other bodies are again prepared to give the public proper instructions in the form of bulletins in case of need this Fall.

Small-Sized Anthracite the Key to the Hard Coal Fuel Conservation Problem

(Written especially for THE HEATING AND VENTILATING MAGAZINE *from data compiled by the Anthracite Coal Service, Philadelphia).*

THE anthracite coal operators are playing an important part in fuel conservation, by teaching the public how to use all sizes of their product to the best advantage; also how to use small sizes with large at a big saving to the consumer.

The increased orders for pea and buckwheat anthracite from retail coal dealers last Fall and Winter, and reports that the number of retailers handling the smaller sizes is increasing rapidly, indicate that more and more of the smaller sizes are being used for home-heating purposes.

Many dealers also report that their customers are finding the small sizes so economical they are reordering this Spring and Summer in much larger quantities, especially for banking their fires and for use on moderate days.

But still more important is the fact that the public is taking a remarkable interest in coal-burning equipment, and particularly in magazine-type heaters for burning the small sizes, and appliances that improve the present types of warm-air, water and steam heaters so that they will burn the cheaper sizes of hard coal.

ANTHRACITE COAL SERVICE'S TRAVELING EXHIBIT

Apparently the anthracite operators' campaign of public education is taking root. For some time they have been conducting a program of information to show consumers how each size of their product may be used to the best advantage. Heretofore, most people thought only the larger sizes could be used satisfactorily in ordinary home-heating equipment. The campaign of public enlightenment is known as Anthracite Coal Service. Last Winter and Spring part of its program was a traveling exhibit.

So successful was this educational exhibit, which closed at Bethlehem, Pa., early in June, that two instead of one traveling exhibits comprise the new program. An eastern exhibit got under way at Portland, Me., July 20 and a western exhibit starts from Syracuse, New York the middle of September. The eastern exhibit, after a week in Portland was scheduled to visit Nashua, Worcester, Providence, New Haven, Springfield, Montclair, Trenton, Reading, Camden, Wilmington and Washington. The western exhibit, after a two weeks' stay at Syracuse, goes to Buffalo, Toronto, Detroit, Grand Rapids, Chicago, Fort Wayne, Toledo and Cleveland. In most of these cities the exhibit will remain a week, and, in a few cities, two weeks.

"THE TRAVELING UNIVERSITY OF OLD KING COAL"

The new traveling exhibits are on a more elaborate scale than the first, because they attempt to enlighten the public on all of the advantages of using anthracite, and more nearly live up to the slogan earned by the first exhibit as "The Traveling University of Old King Coal." The purpose of the exhibits is purely educational. Approved heaters and coal-saving appliances, together with devices for improving combustion, such as special grates and blowers, are being shown. There are also devices that stoke a heater and draw off the ashes automatically, and appliances for making an ordinary heater burn the small sizes of anthracite. Cooking by coal is not overlooked, and a range for this purpose is among the exhibits. Each exhibit requires two van loads of equipment which travels gypsy-like. A store or show-room in the heart of each city is hired for the exhibit showing. To these the public is invited through newspaper advertising, and combustion experts and heating engineers in charge answer questions of those who call.

COAL MERCHANTS' ASSOCIATIONS CO-OPERATING IN MOVEMENT

Thousands of people took advantage of the opportunities of the first traveling shows, and a greater number are attending the new exhibits. The local coal merchants' association in each city is getting behind the "Traveling University" and is urging customers to attend. The coal dealers want their customers to retain confidence in anthracite and to understand how best to use it and the economies that are possible when it is burned properly.

Primarily, of course, these Antracite Coal Service Exhibits are purely educational in scope and nothing is sold. Practical demonstrations show visitors by the use of clever models, how to coal a heater properly, how to fix it for the night or in moderate weather so that it will give the maximum of heat with the use of the smallest quantity of coal.

There is an abundance of printed literature distributed free, including "How to Cut Down the Cost of Heating Your Home," a brochure for those who want to save, and a leaflet "Which Fuel" which discusses the various fuels now being used for heating the home.

WHY THE SMALLER COAL SIZES ARE SO CHEAP

Ever since hard coal was first used, the larger sizes have borne the brunt of the production cost of both the larger and the smaller sizes. This was due, in the beginning, to the belief that only larger sizes could be burned to generate steam; the smaller sizes being deemed a necessary, but useless by-product. Further and more intensive study

of combustion has proved that the smaller sizes can also be burned efficiently, when given the proper mechanical auxiliaries to support the coal and to supply the draft. It is natural that this work was started by the engineers at the mines and the engineers of the large individual power plants, since they alone could afford the expense and had available the engineers capable to do the research which was required.

Following the introduction of the smaller and less costly coal to the power plant came the advent of the central generating plant, and with it the conversion of individual high-pressure units to low-pressure heating boilers. It was therefore only natural that the experience in the high-pressure plants should have been used to advantage by modifying the equipment for burning this coal in high-pressure boilers to adapt such equipment to the heating boiler. It is also logical that heating and ventilating engineers should have taken another forward step and evolved systems for efficiently burning the small coal in the home. Thus to-day there is equipment on the market by means of which the low-priced sizes, such as buckwheat coal, may be burned satisfactorily in the smallest home, as well as in the largest power plant.

TESTING LABORATORY FOR COAL-BURNING APPLIANCES

A laboratory has recently been established, under the direction of Dr. Fernald, head of the Towne Scientific School of the University of Pennsylvania, where equipment for burning all sizes of anthracite is being carefully tested, and unbiased reports prepared. In this manner, knowledge of equipment which fulfills the necessary requirements is being obtained and the satisfactory performance of which will be approved. Likewise data on devices which will not efficiently perform are being collated and this information will act as a protection to the public against the impositions of inferior and unsound equipment.

Equipment already tested and found satisfactory is being exhibited at the various anthracite coal service stations, and they naturally divide themselves into two distinct classifications: The first, where a new building is being erected, or where a boiler is in such condition that replacement is necessary; and the second, for installations in which the boiler is in such a condition that replacement would not seem to be warranted.

MAGAZINE-TYPE BOILERS ADVOCATED FOR NEW BUILDINGS

To burn buckwheat in new buildings, the magazine-type of heater is recommended and exhibited. This heater provides for obtaining the requisite draft without mechanical aid by the maintenance of a relatively thin fuel bed, which reduces the resistance to the flow of air through the fuel. In order to maintain the thin fuel bed, and, at the same time, eliminate the necessity for frequent firings, the magazine feature is included, so that the coal is fed to the grate automatically, as coal is consumed. By the installation of such a heater, it is stated, a double economy is secured in that not only is a cheaper fuel burned, but also the time of the person tending the boiler is conserved, as it is only necessary to fill the hopper once a day and shake the grate once every eight hours.

IMPORTANCE OF DRAFT WITH MAGAZINE-FEED BOILERS

However, in all installations where small coal is being burned, primary consideration must be given to the draft. Manufacturers of magazine-feed boilers agree that whenever consideration is being given to the installation of their heaters, they should first be consulted, so that they may make certain that the flue and stack conditions are such as to insure against insufficient draft which has caused a great deal of trouble in the past.

AUXILIARY EQUIPMENT RECOMMENDED FOR BOILERS ALREADY INSTALLED

For boilers which are already installed, and whose life is good for at least four or five years, auxiliary equipment which may be installed in these boilers has been developed. In the large heating plants conversion to small coal may be effected through the installation of a specially-designed grate, such as the Pyramid, the Herrington, the Pin Hole—either water-cooled or air-cooled—to be used in conjunction with forced draft, and preferably with automatic control. Such equipment may be installed in practically any heater or furnace, with the exception of the warm-air furnace, which is generally unsuited for forced draft, as the gases volatilized from the coal by forced draft are generally at a pressure slightly above the pressure in the leaders and risers. Leaks between the castings cause a flow of gases from the combustion chamber into the ducts through which the heated air is distributed to the various rooms of the house.

MODIFICATIONS NECESSARY IN THE CASE OF SMALL BOILERS

The equipment referred to is for installation in fairly large boilers and it is unfortunate that exactly the same principle cannot easily be adopted to the small boiler in the home. Usually, the home is furnished with a small vertical boiler having a diameter depending on the size of the house, ranging from 16 in. to about 31 in. In order not to make necessary frequent firings in such a heater, a thick fuel bed is carried, and it is not uncommon to fire 6 in. to 8 in. of green coal at one time. Under these conditions, when firing with forced draft, gases are generated at a rate faster than they can be removed by the stack. This causes a congestion of gases just above the fuel bed, and results in leakage of these gases through the opening in the boiler to the basement, and thence throughout the house. This is, of course, very annoying. Further-

more, as the gases which are volatilized are only partially consumed and contain a high percentage of carbon-monoxide, they are subjected to instantaneous combustion, when under slight pressure the gases are ignited by a flame leaping through the fuel bed. Explosions may result of more or less consequence. Such explosions may be minimized and even eliminated by careful and correct firing, which provides for leaving red glowing coals in evidence on top of the fuel bed after firing.

INDUCED-DRAFT SYSTEM

To care for this condition, and to enable the home owner to burn buckwheat in his existing heater with the greatest satisfaction, he can use an induced-draft system, this system being merely a modification of that with which heating engineers are familiar in its application to the larger power plant; the fan being inserted in a by-pass of the smoke pipe from the boiler to the stack. The fan operates automatically to maintain a predetermined temperature, and merely acts as a booster to the stack. The by-pass is furnished with a balance-damper which provides for maximum utilization of and operation on natural draft when the desired temperature is reached.

In addition to the induced-draft fan and automatic control, the system is made complete by a shaking grate designed with 3/16-in. apertures for supporting the buckwheat coal. With this installation a slight negative pressure is maintained above the fuel bed at all times and leakage of gas made impossible. This device is known as "Inducto." A large home builder in Philadelphia already has ordered 150 for one of his operations.

The Standard Heater Company has placed the "Junior Spencer" on the market this year. It is a magazine-type of heater for the small home, built to burn No. 1 buckwheat. It is designed for small installations of water heating systems with a radiation tax of from 350 to 750 sq. ft. It is said to operate on firing periods of from eight to twelve hours. The Molby buckwheat-burning boiler is used not alone for house heating but for tank heaters furnishing domestic hot water as well.

Among the approved devices that are included in the Anthracite Coal Service Traveling Exhibit are American Radiator Company's Type A heater, Minneapolis heat regulators, Pyramid grates, Glenwood kitchen ranges, H. B. Smith Company's boilers, hot water jackets and segment grates, American, Wing and Buffalo blowers, Honeywell regulating instruments, the Electric "Furnaceman," etc.

ANTHRACITE COAL SERVICE AN ADVISORY ORGANIZATION OF COMBUSTION ENGINEERS

In addition to the two traveling exhibits, the anthracite coal operators have also inaugurated an engineering advisory corps known as Anthracite Coal Service. This corps is made up of combustion engineers whose experience and advice have been placed at the service of large purchasers of fuel and heat and power. These combustion engineers are stationed in the following cities—New York (122 Greenwich Street); Philadelphia (Atlantic Building, 260 South Broad Street); Boston (Chamber of Commerce Building); Washington (1415 I Street, N. W.); Providence (Caesar Misch Building); Albany (250 Arkay Building) and Syracuse (208 Gridley Building). Their service is free to all who care to avail themselves of it.

Some of the problems these combustion engineers have already solved are the proper fuel for new buildings, better ways of using all sizes of anthracite coal in a dozen different industries and improved methods of stoking in several hundred different heat and power plants.

These engineers go anywhere in their district to make inspections of plants in large apartment houses, mills, theatres, factories and public buildings. They gladly confer with heating engineers, contractors and builders and with manufacturers contemplating new construction.

Their advice is entirely gratis. They have nothing to sell and are not interested in any particular equipment or system of heating. They are fuel experts and stand ready to give anyone the advantage of their experience and training, and because they have nothing to sell they are welcomed alike by the stoker, the plant engineer and the plant owner.

Anthracite Coal Service is still one more step taken by the Anthracite Coal Operators to show the public how to use their product, in all of its sizes, the most economical way.

The operators issue a small magazine entitled "Anthracite Coal Service" which is replete with practical engineering data for the fuel buyer. It is sent free on request on application to any of the Anthracite Coal Service stations.

Valves for Hot Water Supply Apparatus

It has been a very general practice to accept as quite suitable for the control of hot water supply installations any reliable make of full-way parallel slide or gate valve, and where soft water is the rule and not the exception, in all probability no one suffers to any great extent. But where hard water exists the position is different. For large institutions in the London area where no water softening plant is installed full-way parallel slide or gate valves are not satisfactory for hot water supply; the smallest deposit of scale makes the operation of each valve difficult, and very often renders them useless. In all cases I strongly advocate the installation of full-bore round-way cocks, as supplied by several of our leading valve manufacturers.

These cocks, in common with full-way valves, present a through-way equal to the diameter of the pipe lines upon which they are fixed, but possess the additional advantage of not being placed *hors de combat* by the formation of scale.—HERBERT G. CATHCART, *before the Institution of Heating and Ventilating Engineers.*

Heating New England Homes with Gas

How the Leaven, Introduced at Pawtucket, Spread to Other New England Cities, Raising the Standard of Home Comfort in Many Homes.

IT was only natural that the early experiments in residential gas heating in Pawtucket, as described in the last issue of THE HEATING AND VENTILATING MAGAZINE, should attract attention in neighboring cities, and in the other properties under the management of Stone & Webster, Inc. In the former category, Providence, only a few miles away, with a trolley connection, derived the greatest benefit, and the experiences of Pawtucket pioneers in gas heating were early transmitted to friends in the adjoining city. As a consequence, residential gas heating in Providence is developing rapidly in the footsteps of Pawtucket.

The natural interest in the Pawtucket experiments on the part of executives of the other Stone & Webster properties in this territory was fostered and stimulated by the publication of "B. T. U. Fax" starting as a mimeograph sheet, and later blossoming into a regular house organ, under the impetus of J. W. Howard, of the Woonsocket, Rhode Island property, aided by an editorial assistant in each company. This little publication served as a clearing house for experiences during the days when guess-work preceded the formula of to-day, and it is interesting to see how valuable it became through the keen application and competition of the young engineers in the various companies. Not being intended for general circulation, frankness was the rule, and the following extracts are offered as exemplifying the mutual benefits obtained through this medium, and in the hope that they will serve, as suggestive stepping stones to others who may be interested.

EARLY TROUBLES IN DEVELOPING THE GAS-HEATING LOAD

Cases of Thermostat Trouble That Have Been Cleared Up.

Thermostat spring motor run down will cause chilling or over-heating of house, depending on position of arm when run down.

In attaching thermostat chain to opposite end of pressure-regulator rod, arm on thermostat was not reversed so that gas was on when it should have been off, and vice-versa.

Long run of thermostat chain will cause: (a) gas to remain on, due to slow stretching of chain; (b) gas to stay off, due to sagging of horizontal run of chain.

In the latest approved method of connecting end of snap-valve arm with front end of pressure-regulator rod by means of a stiff rod, and the thermostat chain on the rear end of the pressure-regulator rod, care must be taken so as to prevent chain from kinking (when pressure builds up) to such an extent that the chain becomes too short and the gas will not come on again. Woonsocket uses a sliding wire device, which has proven successful.

Electric thermostat must, of course, not be on circuit which is controlled from light switch upstairs.

Setting of clock is likely to be just twelve hours off; especially if clock has run down, and customer resets it, without checking against the rear dial.

Thermostats in public places, and even in some houses, are often tampered with. These we must re-adjust with a smile—that is service.

Troubles in the Heating System.

Uneven heating throughout a house is likely to happen with gas even though it never happened with coal. When the thermostat reaches its setting, the gas will be shut off and the steam pressure begin to drop. Radiators which are not warm by that time, never will get warm. The remedy is to (1) adjust all air valves so that air can freely escape in the cold rooms and (2) close the radiators (if feasible) close to the thermostat. But warn customer against wire drawing through a cracked valve.

Two Arco Reverse hot-water systems were tied together to one boiler, with poor results, due to high speed of heating. System was changed to steam, and is working well.

On one hot water installation a short circuit developed in two rooms farthest away from the boiler. The contractor claimed that the more rapid circulation secured with the gas equipment caused the water to take the path of least resistance.

Gas Consumption Not Directly Proportional to Outside Temperature.

A careful test for a week at the Halcyon Inn showed that even though the outside temperature averaged less on some days than on others, the gas consumption did not vary as expected. Wind velocities and varying uses of the house account for this fact.

Windy April Affects Factors.

The following total wind miles were registered here in Fall River this past winter:

October, 1923	4,420
November, 1923	3,700
December, 1923	4,410
January, 1924	6,350
February, 1924	3,710
March, 1924	5,700
April, 1924	6,410

From these figures it can readily be seen that April of this year was extremely windy and this fact undoubtedly accounts for the large gas boiler consumption during this month.

Tabulation of Data Secured from Eight

Boiler Installation Number.	Demand Cu Ft per Hr		Size, Make & Type	Sq. Ft. of Theoretical Steam Radiation	Gas Consumption for 1924-1925 Season									Normal Hrs of Operation		Normal Thermostat Setting		Degree Days Operated.	Cu. Ft. Gas Consumed per Degree Day per Sq. Ft Theoretical Radiation.								
	Observation	Estimate			Oct.	Nov.	Dec	Jan.	Feb	Mar	Apr.	May	Total	A.M	P.M	Day of	Night of		Oct	Nov.	Dec	Jan.	Feb.	Mar.	Apr.	May	Season Oct.
1	706	747	1-G-9 Ideal Steam	632	38,700	80,200	129,200	146,400	97,500	88,500	53,200	21,800	655.900	6.30	9.30	70	60	5730	.184	.178	.182	.192	.183	.129	.156	.116	.181	70
2	541	640	8-C-3 Bryant Hot Water	682	63,600	112,200	171,300	184,400	131,100	111,700	84,600	46,900	906,200	6.00	10.00	75	60	6890	.170	.198	.203	.204	.208	.182	.190	.166	.194	133
3	271	280	1-G-40 Ideal Hot Water	351	11,200	30,800	47,200	58,200	38,400	35,800	22,700	10,600	249,200	6.30	9.30	70	55	5470	.110	.170	.162	.168	.190	.180	.194	.126	.180	84
4	533	560	1-G-70 Ideal Hot Water	655	36,800	78,800	127,200	140,600	90,500	81,700	56,600	31,200	643,400	6.30	11.00	72	65	6860	.101	.145	.156	.162	.150	.139	.132	.115	.144	88
5	450	563	7-C-3 Bryant Hot Water	488	23,000	65,600	108,000	107,300	77,500	71,800	50,300	25,300	534,800	6.00	9.00	70	60	5860	.175	.200	.209	.194	.207	.198	.206	.189	.199	69
6	438	467	1-G-60 Ideal Hot Water	494	26,600	55,900	92,700	101,700	66,600	53,000	40,600	19,200	462,300	5.00	9.00	70	60	5850	.156	.174	.164	.168	.162	.150	.148	.124	.160	74
7	319	383	5-C-3 Bryant Hot Water	375	12,700	49,200	90,700	91,000	54,700	50,600	36,600	25,900	412.300	6.30	10.00	68	55	5225	.100	.206	.234	.217	.209	.196	.220	.344	.211	49
8	205	188	1-G-30-Ideal Hot Water	222	10,200	19,100	36,100	40,700	26,900	25,400	18,700	11,900	188,400	6.30	10.00	70	60	5710	.142	.119	.144	.148	.148	.148	.154	.176	.149	73

Load Factors Based on Estimated Demand.

While we are installing future gas boilers at the same water level as the coal boiler and without valves so that, if desired, both might be operated at once, we do not recommend this operation nor use it in a selling talk, for it annuls our boast of absolute cleanliness. About the only value it has, is to make the customer feel assured that he has his coal to fall back on at any time.

Of fifty-three consumers interviewed regarding their coal consumption to February 1st, 1924

18 claim less coal
12 claim more coal
23 claim same amount of coal as

compared with the consumption during the same period last year.

A Study of Factors.

The cubic feet per degree-day per square foot of radiation for January, February and March on three hot water installations has averaged 0.0925 cu. ft. For steam installations for the same period, the average has been 0.198. Converting the steam figure to the same basis as the hot water figure, as calculated, shows an average of 0.119. It seems from these figures that it costs more to heat with a gas-fired steam boiler than with a gas-fired water boiler.

Customer Exaggerates Complaint.

In answer to a complaint that the house was "freezing cold" our men hustled onto the job for fear something serious was wrong and found only that the thermostat setting had been reduced to 65° in an effort to economize. Thermostat was set up to 70°, and all is well.

Experiment with Aquastat.

During the mild weather we have found that the water boilers operate only about twice each day, once in the morning and along towards night. During the day the temperature of the water falls below 80° F. and when the boiler comes on at night considerable heat is wasted in getting the system warm. We believe this to be the reason for a greater amount of gas being used per degree day during mild weather than during cold weather.

Churches Present a Peculiar Problem.

It was discovered that the inside temperature in a church is always much lower than the outside temperature when there is no heat in the building. This condition materially affects cost for heating and should be considered when making future estimates. (P.)

Customer Complains as Result of Own Negligence.

We again had complaint from a customer regarding the action of house-heating equipment, and on investigating and informing the customer that she had forgotten to wind the thermostat spring motor she very sheepishly retracted her complaints and stated it was hard to remember everything about the household.

RAPID GROWTH IN FALL RIVER

In Fall River, enjoying both proximity to Pawtucket and the same supervisory management, Elliott G. Peabody, as house-heating engineer, has developed a house-heating sendout that is expanding rapidly, and with no set-backs, largely owing to the careful study that is made of each prospective customer's installation before the contract is signed. Mr. Elliott brings out some interesting points in connection with computations of predetermination of gas consumption, showing that the personal factor, on the one hand, and the inability to predetermine the wind variations, explain apparently excessive gas consumption. He says:

"Everyone knows that it is not alone low temperature that taxes the heating plant's capacity, but a combination of low temperature and high wind velocity. It, therefore, seems imperative that some account be taken of wind velocities.

"Everyone considers March the windy month, but after looking over the records of the number of wind-miles registered during various months,

...pical Fall River Residential Installations

Load Factors: Actual Consumption / Continuous Consumption x 100							Date of Sale	Estimate Given Customer @ 75¢ per Mcu. ft.		Gross Revenue Received & Difference with Estimate.		Percentage of Total Gas Consumed.								
Dec.	Jan.	Feb.	Mar.	Apr.	May	Season		Cu. Ft.	Cost.	Revenue	Difference	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Total
23.3	26.4	13.5	16.0	9.9	3.9	15.0	Oct 1924	697,400	523.00	491.62	31.38	6	12	20	22	15	14	8	3	100
36.0	38.8	30.5	23.5	18.3	9.8	24.3	July 1924	833,000	625.00	679.65	54.65	7	12	19	20	15	12	10	5	100
22.6	25.4	20.5	17.1	11.2	5.1	15.2	Sept. 1924	296,000	222.00	186.90	35.10	5	12	19	21	16	14	9	4	100
30.5	33.8	24.1	19.6	14.0	7.5	19.7	Aug. 1924	682,600	512.00	482.55	29.45	5	12	20	22	14	13	9	5	100
25.7	25.6	20.5	17.0	12.6	6.0	16.3	Dec. 1923	520,000	390.00	401.10	11.10	5	12	20	20	15	13	10	5	100
22.7	29.3	21.2	17.0	12.0	5.5	17.0	Aug. 1924	542,730	407.04	346.72	60.32	6	12	20	22	14	13	9	4	100
31.8	31.9	21.6	17.7	13.2	9.1	18.5	Aug. 1924	406,600	305.00	309.21	4.21	3	12	22	22	14	12	9	6	100
25.8	28.6	21.5	18.2	13.7	8.5	17.2	Oct. 1924	249,800	187.35	141.30	46.05	6	10	19	21	14	14	10	6	100

we find that whereas our temperatures average fairly close each month from year to year, the wind-miles follow no set rule and the variation from month to month is as distinct as black from white. If we find an installation consumed an excessive amount of gas during a month having average temperatures, we often find the trouble has been due to high winds.

"Just as winds are variables hard to determine in advance, so are habits. The habits of the occupants of the house, as well as the construction of the house, must be considered. Is the family large and are the doors being constantly opened and closed? Is the family interested in keeping the gas bill at a medium, or are doors and windows carelessly left open? Do the occupants know what temperature they wish in the house or what they have been accustomed to? These few factors serve to show that a gas-fired heating device is not unamenable to control and that the man who studies his installation and adjusts it with the idea of saving gas will come out far ahead of the man who disregards it entirely."

One of the first installations in Fall River was in a two-family house where each apartment is heated by its individual heating system. Both tenants had been using coal. The gas boiler replaced the coal boiler on the first floor, while the second floor occupant continued to heat with coal.

The two apartments are identical so that a very good comparison can be made of operating conditions over a two-year period. There are 389 sq. ft. of cast-iron water radiation installed in each apartment, and the theoretical radiation for each is 369 sq. ft. During the 1923-24 season the gas equipment burned 196,900 cu. ft. of gas which, at our present heating rate of 75c per 1000 cu. ft. costs $147.67. The coal boiler over the same period of time burned $113.00 worth of fuel. For the heating season of 1924-25 the gas equipment burned 188,000 cu. ft. costing $141.00, while the coal equipment consumed nine tons of coke, at a total cost of $121.50. This installation consists of a 1-G-30 Ideal gas boiler and a No. 55 Minneapolis heat regulator. An inside temperature of 70° for sixteen hours of the day and 60° for the remaining eight hours was maintained from October 1 to June 1.

An analysis of eight Fall River installations made by Mr. Elliott is worthy of study. There is a decided variation in the periods for which the day and night temperatures are maintained, and in the actual temperatures required in the various homes. The columns showing load factors tell the story of one problem facing the industrial department of a gas company. It will be noted that the highest monthly load factor is only 38.8%, while the highest average for the heating season for any one installation was 24.3%, and the lowest, 15%.

The average seasonal load factor was 18%. This last figure, being for the season of eight months, the load factor figured on an annual basis would be only 12%.

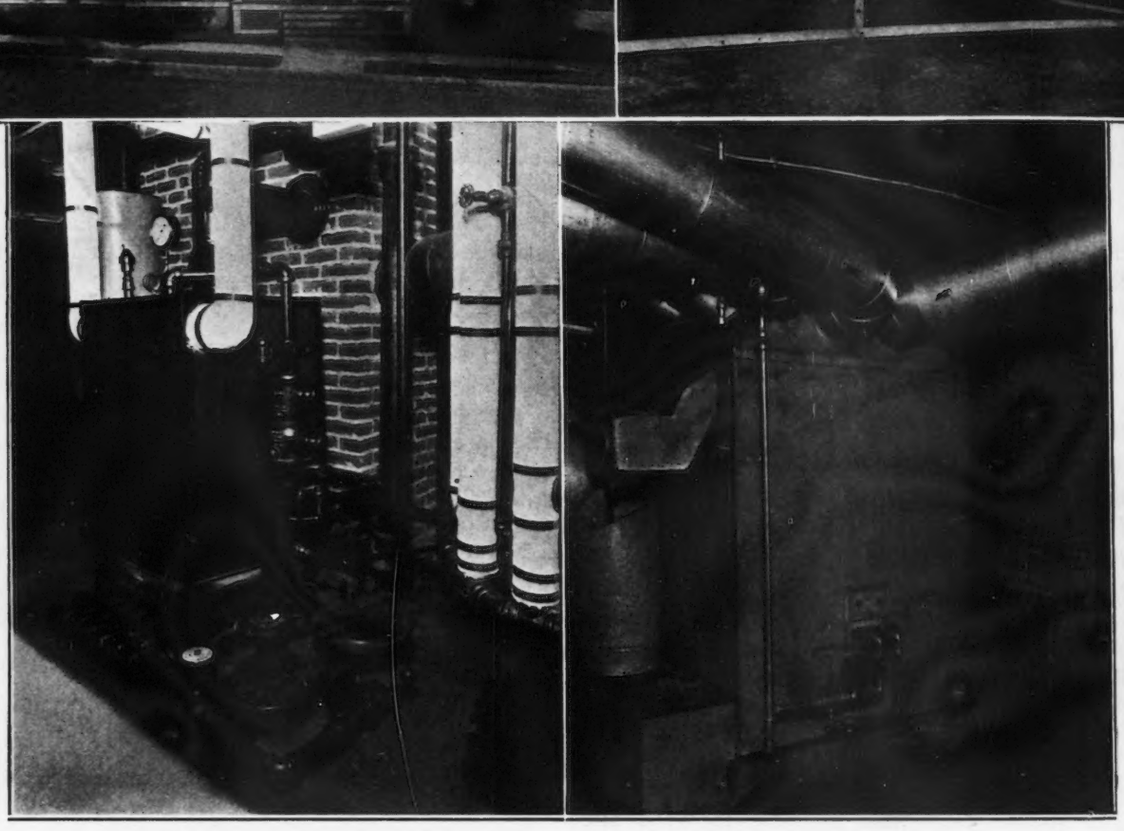
The figures given showing the estimate of the heating cost given to the customer before the installation of the gas boiler and the actual revenue derived from the customer indicate that, the greatest error was about 25%, the estimate being higher than the actual cost, and the closest estimate was only $4.21 less than the actual cost. This tabulation would show that even the effects of the human element and unknown winds would not materially upset calculations based on the rules used.

HAVERILL PLUMBING AND HEATING CONTRACTORS HELP SELL GAS BOILERS

In Haverhill, Mass., another Stone & Webster property has almost synchronized its development with that in Pawtucket. In this city, of over 50,000 inhabitants, it was found that, of 25 heating and plumbing concerns, 80% was engaged or interested in the sale of oil burners. It was the feeling of the gas company authorities that this fact was an advantage, in that the educational work that had been done to attract the public to

It Hardly Seems Possible That Such a Large Home Could be Heated by So Small a Boiler. This is House 8 of the Tabulation on Page 60.

In This Worcester Residence a Rochester Warm-Air Furnace is Used Heating the House for Practically the Cost of the Coal Previously Used.



the advantages of oil for fuel could be easily extended another step to show the added attractions offered by gas. With this viewpoint, the company officials early secured the co-operation of the majority of the heating and plumbing concerns, and to-day they are working in perfect harmony and mutual benefit.

The Haverhill company is authority for the statement that they have heated homes with gas at a cost of only 2% more than the cost of the raw coal fuel previously used. The company expects to install 100 gas-fired boilers this season, and if this aim is true, the total sendout for domestic heating will be high for the population of the community.

CONCORD, STARTING LATE, SHOWS RAPID DEVELOPMENT

In Concord, N. H., starting three years ago, a small but rapidly-growing load has been built up. In 1923-24 there were three installations, in 1924-25 there were 16, and it is expected the coming winter will find 25 gas-fired boilers in use, in this city of 20,000 population.

It is interesting to note the diversity of the installations. They consist of:

1 large club house,
1 church,
1 department store,
2 small apartments,
1 office building,
1 schoolhouse,
12 residences.

These may otherwise be listed as follows:

3 steam vapor systems,
2 steam, one-pipe systems,
9 steam, two pipe systems,
6 hot water systems.

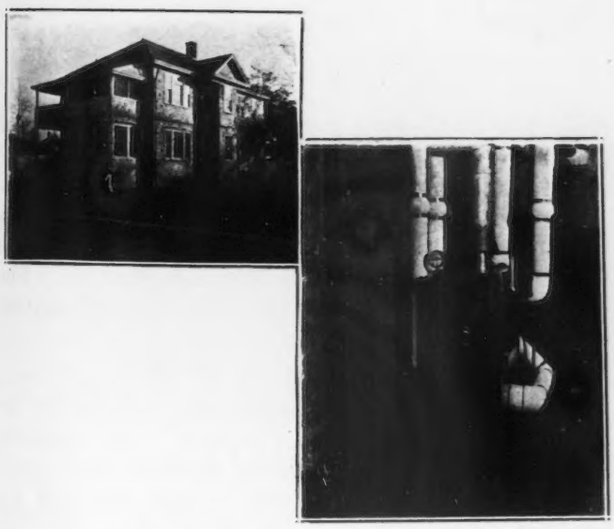
SPRINGFIELD, MASS., HAS NEW GAS RATE

The Gas Light Company of Springfield, Mass., has just offered a heating rate for gas, and several installations are being put in for the coming season. Some experimental heating has been done, but it was impossible to sell gas for this purpose at the regular rate.

WORCESTER PRODUCES INTERESTING DATA

In Worcester, Mass., the Gas Light Company started with an experimental plant in its office building, and one in the home of the manager, in 1923. Last season there were nine homes heated with gas, and it is expected that twenty-five will be served during the coming season. The rate in Worcester, based on $1.35 per M., for the first 3,000 cu. ft. per month, and $0.80 per M. for any additional consumption, would work out very close to the latter figure. On this rate, the following data are interesting, particularly in view of the logical transition from coal to oil and from oil to gas.

The house is of high-class frame construction, shingle and clapboard, with storm windows on the sides toward prevailing winter winds.



In this Two-Apartment House One Tenant Uses Coal and the Other Gas. The Cost of the Gas Last Season Was Only $20.00 More than the Coal

The following are data on this installation:

Cubic contents	17,036 cu. ft.
Exposed wall	1,551 sq. ft.
Glass area	404 sq. ft.
Theoretical radiation	366 sq. ft.
Actual radiation	471 sq. ft.
Temperature maintained, 6 A.M. to 11 P.M.	70° F.
Temperature, night period	65° F.

The original heating plant was a Richardson No. 281 steam boiler, and the average annual cost of operation had been:

Coal, 20 tons at $17	$340.00
Services, boiler firing	96.00
Ash removal	20.00
	$456.00

An oil burner was used during the season of 1923-24, with the following cost, neglecting the pilot and blower motor:

Oil fuel, 5,300 gal., at 10c $530.00

The cost of gas operation for the past winter has been:

Gas fuel, 538,700 cu. ft. $444.16

GAS-FIRED WARM AIR FURNACE PROVES ECONOMICAL

An interesting example of the economy possible with a gas-fired warm-air furnace comes from Worcester.

In this case the house was of the two-family type, one side only being considered. The portion heated with gas has a volume of 16,888 cu. ft., with 1758 sq. ft. of exposed wall and 367 sq. ft. of glass. It had been heated by a coal furnace, and required from 12 to 13 tons of anthracite coal each winter.

For burning gas, a 24-section Rochester furnace was used. The total gas consumption for the last heating season was 262,400 cu. ft., which cost $223.20, this being practically the cost of the coal previously used. All bedrooms were not heated, and care was exercised in the operation of the heater.

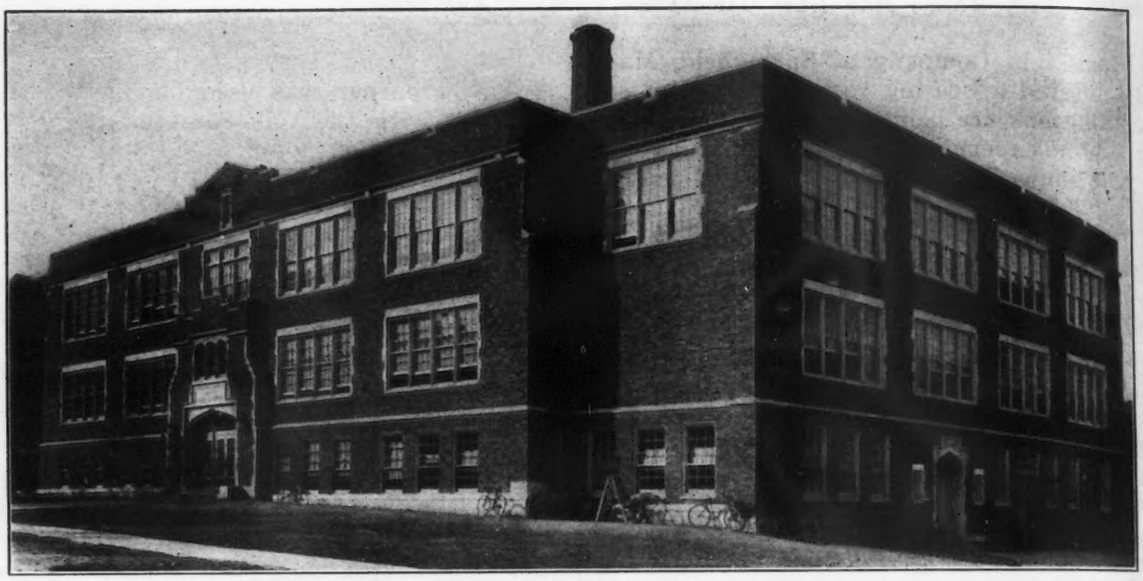
Humidity is maintained, in this heater, by spraying water onto a baffle plate, inclined at an angle, to throw the moisture into the heating sections.

It is interesting to note that, there being two burner units in the furnace, the thermostat operates on one only, thus materially lengthening the periods of off and on. The functioning is similar to that of an oil burner working between minimum and maximum points. In the milder portions of the season, only the burner operated by the thermostat is used.

It is stated that the cost of installation of this furnace is less than would be the cost of a hot water or steam plant, and, coupling this with the demonstrated economy of operation, the ability to properly humidify and circulate the air, it would appear that such an installation would have a strong appeal to the purchaser of a heating plant.

Gas heating in New England will undoubtedly extend to many other cities, and the rate at which it is building up in the centres under discussion clearly demonstrates that even in the supposedly rigorous climate of this section, gas heating of a residence may be accomplished with reasonable economy. It is well out of the experimental stage, and those responsible for its inception and development have secured sufficient data to enable them to expand this business up to the logical maximum sendout possible in each community.

Erratum.—In "Heating New England Homes with Gas," in the July issue, there appeared a table of gas consumption of a home in Pawtucket. Through error, the figures tabulated at the top of Page 64 are, in each case, 1/10 of what they should have been. Thus the consumption for the season of 1917-18 *should have read* "562,100," *etc.*



Leavenworth Junior High School, Leavenworth, Kansas

How They Save Fuel in Kansas

Effective Combination of Direct-Transmission Air Heaters and Steam Boiler in a Junior High School Building

By John H. Kitchen

President, John H. Kitchen & Company, Kansas City, Mo.

A TYPICAL school building, illustrating present-day practice for this type of structure, is the Junior High School in Leavenworth, Kansas, built in 1923-24, at a cost of $225,000. It contains an auditorium with six hundred seats, and a separate gymnasium, with provision for future extension of class-room space. The total contents of the completed building are 618,395 cubic feet, and the present space heated, 570,715 cubic feet. Bituminous coal is used, having a heat value of 11,065 B.T.U. per pound. During the winter of 1924-25, 197 tons were burned costing $7.00 per ton delivered. This brought the heating cost per 1000 cu. ft. for the season to $2.42. The cost of electric power used for the ventilating fans, $36.94 per month, is more than offset by the saving in engineer's salary (no licensed engineer is required with this type of plant).

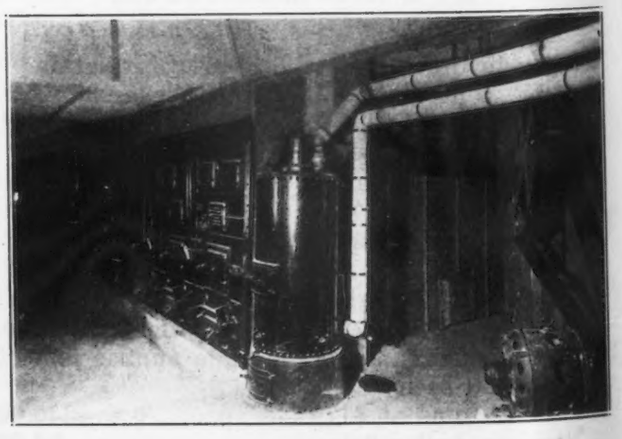
DESCRIPTION OF SYSTEM

Five No. 88 direct-transmission heater units are set in a battery with a No. 36-12 combined air heating and steam boiler, manufactured by the American Foundry and Furnace Company, Bloomington, Ill. Two of these units heat the auditorium-gymnasium in connection with a separate fan (13,000 C.F.M.), as this portion of the building is used independently of the main building, which is handled with another fan (38,000 C.F.M.).

The direct-transmission units can be fired separately or together, hence the system is extremely flexible to weather conditions. Corresponding flexibility is secured by using two fans instead of one large fan. While the initial cost is more for two fans and motors, this is more than compensated for by reduced operating expense. The direct-transmission heaters are of the cast-iron air-tube type, especially designed for fan service. The units are encased with asbestos-steel insulated casing about 3 in. thick.

Steam is used as auxiliary to the direct-transmission heaters, radiators being located in the offices, toilet room and laboratory. No radiators are placed in the class-rooms, auditorium or gymnasium or inside corridors. These are "all air heating."

The system is designed on the basis of 30 cu. ft.



Apparatus Room, Junior High School, Showing Heater Units

of air per pupil. By an arrangement of dampers the combined air delivery of auditorium and gymnasium may be concentrated on either room separately, thereby increasing the air delivery to care for large audiences. This is an important point as the attendance in these rooms varies. In buildings of this type the auditorium is used not only for school purposes but for evening entertainments. School buildings more and more have become civic centers and hence special consideration should be given to this factor, as well as to the normal school attendance. The small cost of a damper, controlled by compressed air, directs the full force of the air into the auditorium or vice versa into the gymnasium. (The latter room is used frequently for basket-ball games when the spectators' gallery is crowded to the limit—*hence, the greater need of increased air supply*).

Horizontal concrete insulated ducts (one for warm air and the other for tempered air), connecting to each fan, extend under the floor of the corridor and are provided with mixing dampers automatically controlled for the individual rooms. The outside air is introduced near the roof level.

Fresh-air louvre dampers, controlled by a compressed air switch, are located in the apparatus room (one switch for auditorium-gymnasium and another for the main building). These switches are lettered and numbered to obviate any mistakes in regulation. Recirculating dampers are likewise controlled. All rooms are automatically controlled. Moisture to the heated air is supplied through humidifiers, located above the series of heat generators, and constant water level is provided automatically controlled. The percentage of outside and recirculated air may, therefore, be regulated to *meet* the existing conditions; i. e., at night time or after school hours the outside air dampers are closed and the recirculating dampers opened, thereby maintaining the building at a reasonable temperature at minimum fuel waste, even in the coldest weather. The air is discharged from various rooms in the conventional way at the floor line, connecting to the vent duct in attic (with by-pass connection to the recirculation duct).

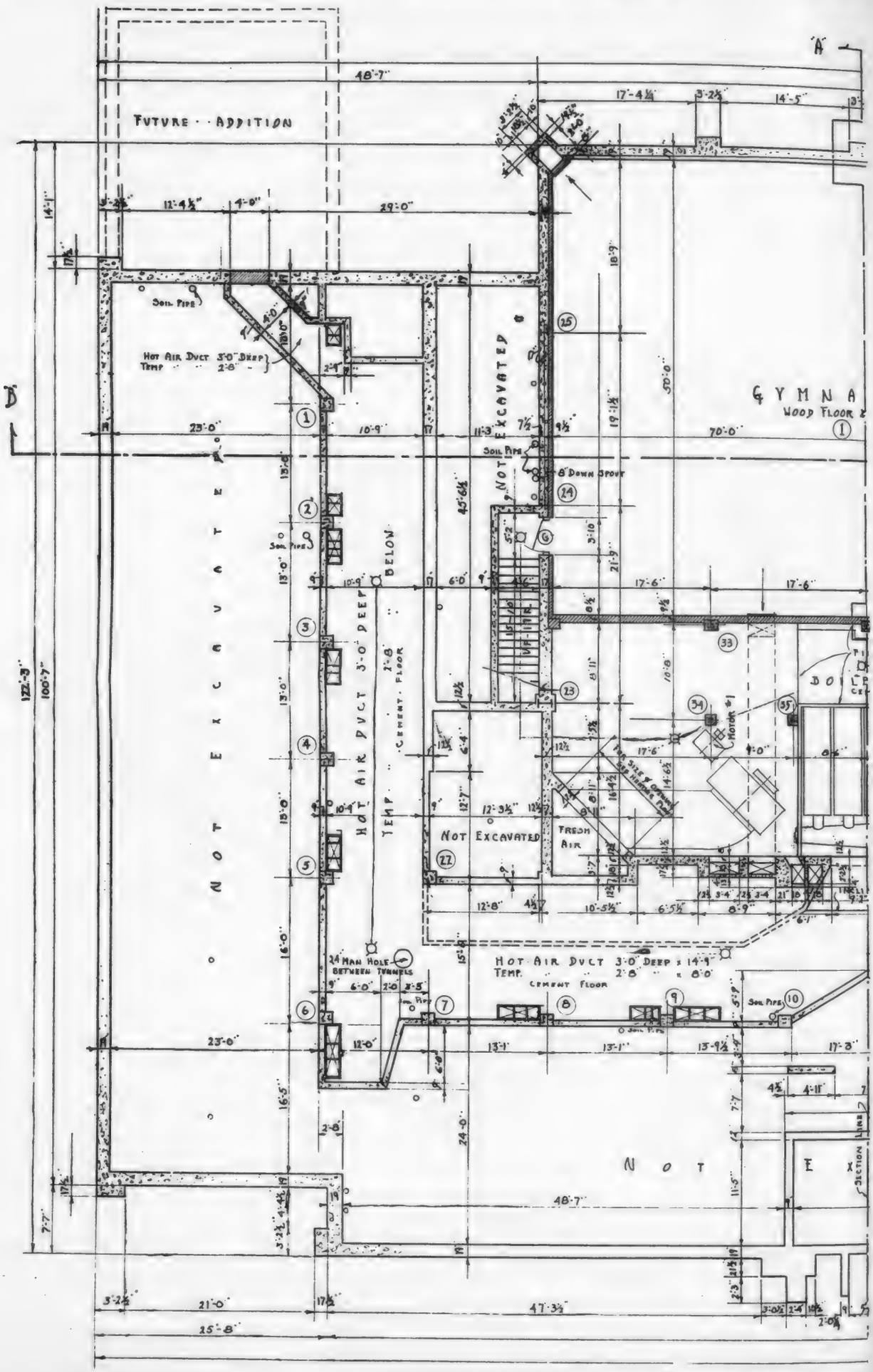
The class-rooms or smaller rooms have one exit through the vent elbow (which is an open-face vent elbow for inspection and cleaning). The study hall has a series of vent openings (as well as air supplies). The auditorium has more numerous air supplies and vents. Experience proves the wisdom of numerous openings for both the air supplied as well as the discharged air, as *better distribution is thereby assured.*

Another View of Apparatus Room, Showing Blower and Duct Connections

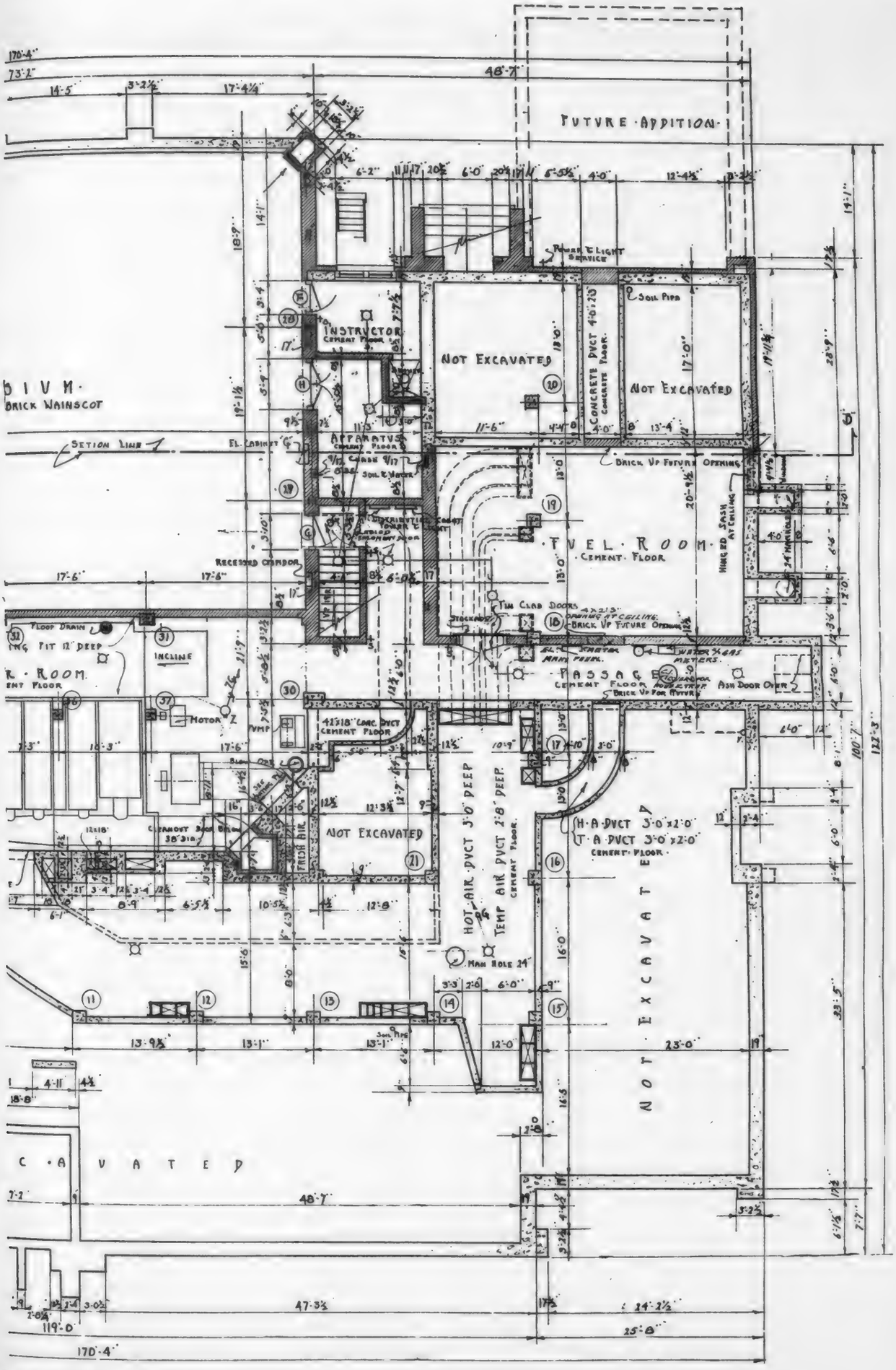
In this building the diffusers on the air supply openings are arranged both for horizontal, as well as vertical, adjustment. Thus the air is deflected tangentially to the walls, ceiling and floor; thereby avoiding air pockets or injurious drafts. The volume damper to each opening is in the flue behind and below the diffuser.

Air splitters are provided in the diffuser elbow, which assures near uniform velocity through the entire area of the diffuser.

(*Continued on Page* 87)



Basement Plan, Junior High



School, Leavenworth, Kansas

Boiler Ratings and Fuel Conservation

Progress of the Boiler Calibration Movement in Wisconsin and What it Has Accomplished to Date

By Ray A. Small, Advisory Engineer

Formerly Ventilation Engineer for the Industrial Commission of Wisconsin

EFFICIENT combustion and application of heat are essential to conservation of fuel. That means the boiler or furnace should be particularly adapted to the work expected, in size as well as type. Like any other inanimate product, heaters can properly function only to the extent of their respective designs and capacities, and with a given design a heater that is too large or too small will show reduced efficiency—and increased cost. It is important, therefore, to select the right heater for each particular job, and this has been an increasingly difficult attainment for catalog users.

The observations and comments set forth herein are based upon the writer's personal experience in the service of the Industrial Commission of Wisconsin, and are not dictated by that body. That service was amicably discontinued nearly a year ago but the writer's interest and sincerity has not lapsed and he wishes personally to support further progress along this line. This article is, therefore, written to help improve the present trade and professional situation in regard to correct calibration of commercial heaters, and to hasten the day when heater catalog ratings, or some similar general source of information, may be relied upon by the trade and profession.

In the days of guessing the heat load by an impromptu inspection or some rule of thumb, it was perhaps equally practical to "guesselect" the boilers from sales ratings; but with modern methods of calculating the heat load amount and character, the selection of heaters therefor should be correspondingly more accurate. To properly protect his occasional-purchaser client, the engineer should be able to pick the right heater to fit the load and working conditions—accurately and unbiased by trained arrows or printer's ink.

EFFECT OF CONFUSED BOILER RATING SITUATION UPON ENFORCEMENT OF CODE

With many different heater propositions to approve or disapprove every day for the Industrial Commission of Wisconsin, the necessity of having more accurate ratings on boilers and furnaces, was so vividly impressed upon the writer that he became a sort of crank on the subject. There seemed to be no uniformity of practice in selecting heaters. Warm-air furnace catalog ratings were expressed in multiple figures of cubic feet of space for furnaces of really insignificant working capacity, and the boiler catalogs were not far behind in their use of optimistic numerals.

Previous private practice discounts were inaccurate because instead of selecting from one or two familiar makes, it was necessary to approve selections from a large number of makes; and, in the absence of test data, it was necessary to apply a blanket discount of heater catalog ratings in order to avoid cumulative personal bias in making decisions.

HOW ENGINEERS DIFFERED IN ESTIMATING SIZE OF BOILER FOR GIVEN JOB

Varied as were the propositions presented for approval, the writer still thought the better engineers were probably using some reliable method of selecting boilers. To settle a certain problem in boiler size difference, a prominent Wisconsin manufacturer of steam specialties agreed to join in putting out a questionnaire, and abide by the result. We prepared and agreed upon a given statement of the problem and asked selection of a boiler for the given load and one for a larger load.

About 65 of these questionnaires were sent out to a list of widely-known engineers of mutual selection. Of the 20 or 25 answers we were surprised to find no two alike, even among selections from a given well-known line of manufacture. The only two that were within hailing distance of one another were based on the Chicago Master Steamfitters Association's comparative boiler size schedule.

PRAISE FOR CHICAGO STEAMFITTERS' BOILER CODE

While this schedule admittedly overlooked some very important elements of boiler selection, great commendation is due to the Chicago Master Steamfitters' Association for the progress and initiative expresed in their boiler ratings and their hearty co-operation with the struggling Madison office.

Meantime, public and trade interest had been aroused enough to warrant the appointment of an advisory committee of experts to work out technical features of a much-needed standard code of practice. The Advisory Committee agreed to the proposal that the Chicago Master Steamfitters' Association boiler-rating schedule be adopted as a temporary standard of comparison between boilers of the many different makes, pending a more accurate method of rating or selection.

Obviously, the working capacity of a boiler depends more upon the resultant steam produced, the amount and kind of fuel used and the intensity of draft required, than upon the incident detailed

relation and arrangement of grate surface and heating surface, but the task of officially testing all the commercial boilers was too great for immediate consideration and sales department test reports were as misleading as the catalogs. The only alternative, therefore, seemed to be arbitrary comparison of heaters on the basis of heating surface and grate surface and assuming an average effectiveness thereof for the several different lines of manufacture.

HOW BASIS WAS DETERMINED FOR RATING WARM-AIR FURNACES

For warm-air furnaces the way was prepared somewhat by an earlier code requirement that the heating surface be at least 30 times as great as the grate surface. Relatively few of the round-pot warm-air furnaces could satisfy this condition and yet many possessed enough capacity and lower price to make them suitable for small installations. Therefore the 30 to 1 ratio was adopted as a median and departure therefrom was allowed up to 40 to 1 and down to 20 to 1 with corresponding bonus or demerit at the rate of 1% per unit of ratio.

The base rate of combustion was 8 lbs. per square foot of actual grate for round pots and 10 lbs. for horizontals, on gravity jobs. The fuel was assumed to be 12,000 B.T.U. soft coal, and the furnace overall efficiency 60%. Thus a horizontal furnace would have a rating computed on basis of 79,200 B.T.U. for 40 to 1 ratio, 72,000 B.T.U. if the ratio were 30 to 1, or only 64,800 B.T.U. per square foot if the ratio were 20 to 1. A flat increase of 50% was allowed when suitable fans were used with the furnaces. This allowance was admittedly somewhat impromptu but the general satisfactory success of fan-furnace installations throughout the State seems to substantiate the figure.

The leading warm-air furnace manufacturers co-operated with us in this work, but the manufacturers of enlarged stove-pipes were reluctant about filing their heating surface data. With boilers our experience was somewhat similar, but, having a temporary method of selection from catalogs, we were able to carry on without attaining a completed schedule of allowable loads based on grate and heating surfaces. And happily so, because the maze of detail relation and form of boiler heating surfaces is well-nigh bewildering when one attempts to appraise the resultant heating effect. The American Radiator Company, Hart and Crouse Company, and Kewanee Boiler Company, and others, assisted by furnishing confidential data.

LEWIS CURVE PRESENTED AT CONFERENCE OF BOILER MANUFACTURERS

Several curves and formulæ were worked out, and discarded in turn because of inconsistency with proven installations or visible harshness on some line of boilers. From recorded data it seemed next to impossible to segregate the influence of heating surface from the effect of firing methods, chimney service and patented details. Finally, however, an average curve was evolved by Samuel R. Lewis, consulting engineer, of Chicago, a member of the Advisory Committee, from which it was hoped material progress might result in approximating true allowable loads based on physical characteristics of boilers, and this curve was presented before a conference of boiler manufacturers called in Madison.

RESOLUTION ADOPTED BY BOILER MANUFACTURERS

Some of the innate distrust of State regulation of technical matters was allayed when the manufacturers were convinced that the real purpose in Wisconsin was to find an accurate method of estimating actual boiler service, instead of merely exploiting detail secrets of design. The result of this conference was the passage of a resolution offered by Mr. Herendeen, representing the National Boiler and Radiator Manufacturers' Association, "that the State of Wisconsin, through its Industrial Commission, formulate a set of rules governing:

"A. Height and size of chimney;

"B. Type and value of fuel, subdivided to
a—anthracite
b—bituminous;

"C. Attention to firing;

"D. It is understood that the steam at nozzle will be 97% dry.

"On receipt of which, the boiler manufacturers will submit to the Industrial Commission the performance of their boilers in pounds of steam at the nozzle, under these formulæ."

HOW HART & CROUSE BROKE SPELL OF INFLATED RATINGS

About this time the Hart & Crouse Company, of Utica, N. Y., was preparing new ratings of their boilers, and shortly afterward broke the spell of inflated catalogs of publishing capacities based on heating surfaces contained in their boilers. This met the ever-growing demand of engineers and observant laymen to know the amount of boiler grate and heat-transmitting surface, in their individual attempts to get at the true safe working capacities so generally obscured in catalogs. The Hart & Crouse Company deserves unstinted credit for the courage and initiative shown. It included a somewhat dogmatic assumption of heating surface effect and did not emphasize the influence of draft, but it was a forward step in professional and trade progress.

TABLE OF CHIMNEY SIZES AND HEIGHTS ADOPTED

Anyone who has tested boilers can realize, to some extent, the influence of vailable draft on the capacity produced. Simultaneous progress was therefore being made toward construction of a curve or chart, to be used as a standard basis of

determining chimney size and height. With a given standard of efficiency and surplus air for combustion, the amount of combustion gases delivered to the chimney varies directly as the amount of load carried by the installation, although some heaters might require more or less draft at the smoke collar under like conditions. It seemed reasonable, therefore, to standardize the size of chimney per pound of steam at the boiler nozzle and vary the height to suit the draft requirements of the particular boiler connected thereto. Accordingly, the following table was prepared and now appears in the new Heating and Ventilation Code.

CHIMNEY SIZE TABLE

Allowance has been made for possible 50% overload capacity. For rectangular chimney areas divide circular areas by 0.80. In rectangular chimneys the long side of cross section should not be greater than 1.5 times the short side.

Size Diam. In.	Equiv. Direct Radiation Sq. Ft.	B.T.U. per Hour	Size Diam. In.	Equiv. Direct Radiation Sq. Ft.	B.T.U. per Hour
8	350	84,000	40	28750	6,900,000
9	520	125,000	41	30500	7,320,000
10	700	168,000	42	32500	7,800,000
11	880	211,000	43	34500	8,280,000
12	1100	264,000	44	36500	7,770,000
13	1320	317,000	45	38750	9,300,000
14	1580	379,000	46	41000	9,840,000
15	1900	457,000	47	43500	10,450,000
16	2270	545,000	48	45750	10,960,000
17	2680	643,000	49	48250	11,600,000
18	3160	758,000	50	50500	12,120,000
19	3700	888,000	51	53250	12,800,000
20	4270	1,025,000	52	56000	13,450,000
21	4900	1,175,000	53	58750	14,100,000
22	5580	1,340,000	54	61500	14,750,000
23	6320	1,515,000	55	64250	15,440,000
24	7100	1,701,000	56	67000	16,100,000
25	7900	1,895,000	57	70000	16,800,000
26	8770	2,105,000	58	73000	17,550,000
27	9730	2,310,000	59	76000	18,250,000
28	10750	2,580,000	60	79000	18,950,000
29	11920	2,860,000	61	82250	19,750,000
30	13150	3,140,000	62	85500	20,500,000
31	14500	3,480,000	63	89000	21,350,000
32	15750	3,780,000	64	92500	22,200,000
33	17200	4,130,000	65	96000	23,050,000
34	18750	4,500,000	66	99500	23,900,000
35	20250	4,860,000	67	103000	24,700,000
36	21750	5,220,000	68	106750	25,600,000
37	23500	5,640,000	69	110500	26,500,000
38	25250	6,100,000	70	114500	27,500,000
39	27000	6,480,000	71	118500	28,500,000
			72	122500	29,400,000

Some attempt was made to establish a scale of allowable increase for loads on boilers connected to chimneys of extra height. Allowances of 1% increase of load per 5% extra height were made in several instances where additional chimney height was architecturally admissible and floor space was limited.

Generally, however, the standard chimney requirements were found flexible enough for new work. It enables the architect to make immediate allowance for chimney space, and the engineer can later select the style of heater consistent with the chimney height allowable with the particular architectural treatment being used. Indeed, indications pointed to very satisfactory experience with the chimney solution.

ABRAM COX STOVE COMPANY'S METHOD OF SELECTING BOILER SIZES

Recently the Abram Cox Stove Company of Philadelphia reduced the basis of selecting boiler sizes to that of the chimney service provided. This made the determining factor one's confidence in their appraisal of their boiler performances under different draft conditions. This plan is another laudable step in progress because it reduces the scientific reason for such a wide variation of boiler performances down to terms of common vernacular. Almost any one will say that the higher the chimney the more it will draw—and it is true within practical limits. Similarly, we find that the bigger the smoke flue the larger the boiler that may be safely connected thereto. The Abram Cox Stove Company plan serves to emphasize this fact and again punctures the shell of blind boiler ratings.

BOILERS CAN MEET RATINGS IN CERTAIN SPECIFIC INSTANCES

Study of general information at hand and conferences with representatives of individual boiler manufacturers, convinced the writer that there was scarcely a boiler manufacturer or furnace concern that could not point out specific instances where his heaters were apparently delivering more than their catalog rating, and similarly point out instances where his competitors' boilers were failing to reasonably approach the catalog ratings. Memory reverted to college testing room and laboratory crews that vied with one another to see which could get the most steam out of a given setting; and how one could keep an even steam line on the Bristol chart in a car-ferry firehold and have time to rest, where the firemen on other watches were continually in trouble. Clearly there must be a check against forcing the boiler in making official tests.

ESTABLISHING STANDARD METHODS AND DATA FOR TESTING BOILERS AND WARM-AIR FURNACES

Having obtained the promise of the boiler manufacturers to test and report their boilers under our rules and abide by the allowable loads established thereunder, the next problem was to establish standard methods and data under which laboratory test performances would not be unreasonably in excess of those actually attainable in practice. We cannot stipulate the fling of the shovel or the cleaning of fires, but we can limit the frequency of applying fuel so the janitor-fireman can keep steam, in practice, by firing oftener.

(*Continued on Page 72*)

How the Wisconsin Industrial Commission Would Rate Heating Boilers

Proposed Rules for Testing Heaters Using Solid Fuel, to Furnish Data on Performance, Instead of on Physical Characteristics

UNDER the heading of "Manufacturers' Supplement," the Wisconsin Industrial Commission proposes the following rules for testing heating boilers and warm-air furnaces.

PREFACE

In the interests, welfare, safety, comfort and health of the public who own or use or frequent public buildings and places of employment in this State, it becomes necessary that the Industrial Commission establish equitable maximum allowable loads for boilers and furnaces used for heating and ventilation of public buildings.

In compliance with Order 5820-8, of the Heating and Ventilating Code, test data on boilers and furnaces obtained and filed according to the following rules will be received in preferred lieu of physical characteristic data on such heaters. The Industrial Commission will issue, upon request, standard forms to be used as models in arranging and filing test data on heaters.

It should be noted that the term "heaters" includes boilers, furnaces and stoves, and the following rules apply particularly to the testing of such heaters using solid fuel. Modified rules will be established, if necessary, for heaters using liquid or gaseous fuels.

The purpose of receiving and requiring test and other fundamental data, is not to rate their heaters for manufacturers, but to establish safe allowable heat loads the heaters will carry in practice, for the public.

General Rules for Conducting Solid-Fuel Heater Tests

1—*Simulating Practical Operation.* In general, each test shall be conducted in a manner to simulate average practical safe operating conditions as nearly as possible. The heater shall be taken from ordinary stock and shall be fitted, equipped and operated with stock tools, combustion control and other accessories throughout the test. Where automatic or involuntary combustion-control devices are regularly with the heater on the job, the operation of such devices shall not be molested or aided at any time during the test. All heaters under test shall be assembled, covered, encased, and housed strictly according to respective standard settings used in practice, and a working drawing of such setting, and preferably a detailed photograph, shall accompany the log summary sheets of tests filed with the Industrial Commission.

For warm-air furnaces and jacketed stoves, the details of setting are so important that allowable loads based on tests will not be considered specifically applicable to any dissimilar setting, respectively. In all cases natural draft shall be used or simulated and shall be maintained free from influence of mechanical air currents or pressures at the ash pits throughout the tests.

2—*Chimney.* The chimney size used with each heater under test shall be that indicated in chimney size table shown with Order 5867-1 of the Heating and Ventilation Code, for respective performances. The height and construction of chimney used in tests shall be selected by the test director and stated in log sheets. The height should be selected on basis of emergency load not less than 50% greater than test performance and corrected for 1000-ft. altitude. The smoke collar of heater should preferably be connected with chimney by straight smoke pipe not less than 8 ft. nor more than 10 ft. long, to simulate average practical installation.

3—*Fuel.* For soft coal-burning heaters, the fuel used throughout the test shall be bituminous coal having not less than 25% volatile matter, 10% ash and 5% moisture as fired, and the official test results will be corrected to coal heat value of 12,000 B.T.U. per pound as fired. For hard coal-burning heaters, correction will be made to 13,500 B.T.U. per pound as fired. For wood burners, the fuel shall have heat value not exceeding 6,000 B.T.U. per pound, and correction will be made to wood heat value of 5,000 B.T.U. per pound, as fired.

4—*Firing Intervals.* Test firing intervals shall be not less than 4 hours for performance up to 2,000 sq. ft. E.D.R. (equivalent direct radiation), diminishing at the rate of 18 minutes per 1,000 E.D.R. for greater performances up to 12,000 sq. ft. E.D.R., and not less than 1 hour for performances of 12,000 sq. ft. E.D.R. or more, for soft coal-burning heaters. For hard-coal burners, increase the firing interval 50%. For wood burners, decrease the firing interval 50%. Throughout the tests there shall be no intermediate firing or application of fuel or attention to dampers during the firing intervals hereinbefore established.

5—*Steam and Heat Delivery.* Throughout the test, the steam delivery of boilers shall be at least 97% dry, as determined by a separator having an efficiency of 95% placed in the steam outlet pipe, and the average steam pressure shall be not less than 2.5 lbs. gauge. For warm-air heaters with fan assistance, the heated air may be delivered from the heater setting in two or more trunk ducts, but for gravity tests the heated air shall be delivered in a single pipe or duct leading from the heater setting to a point not less than 2 ft. clear of the outside of setting nor more than 5 ft. above the setting.

6—*Other Conditions.* The other conditions of tests shall comply with the standard instruction sheets for the particular kind of heater being tested. All items called for on standard log sheets and summary sheets, issued by the Industrial Commission, are to be covered from actual accurate observation or computation thereupon.

7—*Physical Characteristic Data.* In the absence of accurate test data, heater manufacturers are required to furnish accurate physical characteristic data pertaining to their heaters, on properly-executed form issued by the Industrial Commission, before such heaters may be approved or used for installations under the Heating and Ventilation Code.

Note 1. *Paper Ratings Approximate.* Ratings based on physical characteristics of heaters are intended to enable the Industrial Commission to neutral determination of adequacy in individual cases prior to receipt of test data. While such ratings cannot be expected to be absolutely correct in all cases, they are intended to approximate the true values, and to sooner or later give way to accurate test data.

Note 2. *Paper Rating Basis.* Physical characteristic furnace ratings have been uniformly established on the following basis: Adequate chimney size and height; 12,000 B.T.U. soft coal; 60% over-all efficiency; base rate of combustion 8 lbs. per square foot of grate for round-pot furnaces, and 10 lbs. for horizontal furnaces;

base rate of combustion applicable to gravity installations of heaters having median design comprising 30 sq. ft. of heating surface (See Order 5800-14) per square foot of primary grate surface; 1% bonus or demerit for each unit of ratio above or below 30 to 1; no heating surface considered in excess of 40 to 1; no grate surface considered in excess of 1/20 of the heating surface.

Under the heading "Other Conditions," it will be noted, reference is made to standard instruction sheets to be issued by the Industrial Commission for testing boilers and warm-air furnaces and tabulating the test results. Limited space permits showing only part of the furnace test instructions, omitting all the several data forms for both furnaces and boilers.

The proposed boiler test rules adhered closely to the A. S. H. & V. E. proposals for instruments, piping, feed water, separation, etc., and required a 16-hour minimum test so as to avoid freak results. Except for hard-coal tests, the continuous-fire method was required.

For warm-air furnace tests, the proposed instructions were more largely original but reverted to the boiler rules in regard to firing, sampling, etc., using continuous-fire method only. Following are excerpts from the "Preparation For Test" rules.

1. SETTING. Erect, install, cover and connect the furnace or stove to be tested, in full accordance with the complete working drawings therefor attached.

2. CONTINUOUS AIR SUPPLY. Provide continuous and practically uniform air supply to heater airways.

3. CLEAN SURFACES. Thoroughly clean fire side and air supply side of all heating surface, firebox, ashpit, flues and gas passages.

4. APPARATUS AND INSTRUMENTS. Provide reliable apparatus and instruments arranged in such manner as to insure correct data, such apparatus and instruments to include: . . .; and a calibrated pitot tube or tubes for accurately measuring the quantity of air delivered to and from the heater.

9. CALIBRATION OF AIR DUCTS. Air flow in ducts is calculated from measurement of velocity or velocity pressure. The velocity of the air in feet per minute equals 1096.5 times the square root of the quotient of the average velocity pressure divided by the weight of a cubic foot of the air in pounds.

Test readings of air velocity are taken in straight runs of ducts and reduced to average readings, which are always less than the center readings. To find the average reading, each duct is calibrated in place as used in test. . . .

An affidavit form is included for use in filing the boiler and furnace test data for official record.

(*Continued from Page* 70)

INDUSTRIAL COMMISSION'S "MANUFACTURERS' SUPPLEMENT"

With these objects in view, a Manufacturers' Supplement was prepared for the Code, substantially as shown herewith, comprising the rules of test and report of data for solid-fuel type boilers and warm-air furnaces. The great volume of work and very limited personnel has made it impossible for the Industrial Commission to continue this part of the work, and it was apparently thought advisable to withhold this supplement from the current edition of the Code, to give further opportunity for change or refinement.

Final progress will result from consensus of opinion and research. There is general recognition of the need for accuracy in predetermining the safe working load of heaters under given conditions, and this accuracy is generally unattainable from catalogs. These rules are presented for professional consideration, not as a finished product but with the hope that more thought and research will thus be focussed on the subject; and that out of perhaps a number of attempted solutions will come a real answer to the heater selection problem.

The subject test rules contemplate accurate data from which to predetermine safe allowable loads that specific heaters may be expected to carry in practice with given draft and fuel, and yet allow the manufacturer to make his own tests and discover his own secrets of design and improvement or to discard ineffective models, without public disclosure. One of the first to file new test data was a prominent manufacturer of steel boilers. Similarly, the leading cast-iron boiler manufacturer furnished test curves for a series of performances. These curves are now being used, with apparently conservative, but satisfactory results.

INFLATED CATALOG RATINGS NO REFLECTION ON MANUFACTURERS' INTEGRITY

It may not be out of place to say that condemnation of inflated catalog ratings is not intended to convey doubt of manufacturers' integrity. Catalogs have been essentially commercial publications, and it is only natural for enthusiastic sales managers to treasure and accumulate records of extreme performances and overlook the attending draft and firing conditions that made the performances possible. When his competitor is nerved to reduce the apparent price of heater metal per rated heat unit by raising the rated units without corresponding improvement in the boiler, the commercial thing to do is to follow suit and go one better. Current catalogs are the result of commercial strife, rather than primary purposes to defraud.

ADVANTAGES OF TRUE APPRAISAL OF WORKING CAPACITIES

Regardless of what temporary advantage inflated ratings may seem to bring, the profession and trade, as well as the consumer, will ultimately gain by a true appraisal of heater working capacity and limitations. If a given model hasn't enough heating surface to make good it is better to improve the boiler or take it off the market instead of waiting for credulous consumers to waste ton after ton of good fuel, and dollar after dollar of good money, until they begin to condemn the line and stop the sales. Sooner or later the consumer is going to buy intelligently, realizing that the right boiler and size saves him worry, waste, fuel and money; and the manufacturer who has restored confidence in his catalog data will sell the boiler.

The Iso-Degree-Day Chart

An Important New Graphic Method of Showing Heat Requirements in Any Locality in the United States and Canada

By P. E. Fansler, E. E.

Associate Editor, THE HEATING AND VENTILATING MAGAZINE.

THE chart accompanying this article, published as a supplement, has been characterized as the most important single contribution in recent years to the science of heating. It is offered to the industry with the confident expectation that its usefulness will redound to the progress of the art and to the prosperity of all who have to do with the heating of buildings.

IT would seem but logical to extend the usefulness of the unit developed by the American Gas Association, and cleverly designated the "degree-day." This unit, the product of one degree difference in temperature and a 24-hour period of time, affords a direct measure of heat requirements over any period, in any clime, and formed the subject of the data sheets in THE HEATING AND VENTILATING MAGAZINE for June, 1925.

This amplification I have developed along the lines of the charts furnished by the United States Weather Bureau, and, adopting similar nomenclature, have designated it an "Iso-Degree-Day Chart."

The data sheets describing the method of computing the degree-days for any locality were accompanied by a table giving the aggregate degree-days, for a normal heating season, of thirty-five cities in the United States. These calculations have now been made for several hundred cities and towns, on the basis of weather bureau averages taken from fifty years' observations. With these figures noted on a map of the area under consideration, it becomes possible to draw lines across the map, representing equal heat requirements. These lines have been drawn to represent degree-days in multiples of 1000, and, roughly, nine lines cross the United States. Those in Canada, deduced from data supplied by the Dominion Metereological Service, extending as far north as Dawson, Yukon, indicate heat requirements as great as 15,000 degree-days.

APPARENT INCONSISTENCIES AND THEIR EXPLANATION

It is manifestly difficult to reconcile all of the points for which computations were made with the location of the nearest iso-degree-day line. For instance, a city may be found to rate 6,270 degree-days, and yet be south of a smooth curve representing 6,000 degree-days. The line might have been looped to pass south of this point, but, except in rare cases, it would seem best to preserve the flowing character of the lines and amplify this indicative graph with the actual figures placed under the names of the points for which they were determined. The error, in individual cases, should not destroy the general accuracy of such results as may be computed from these data.

The general trend of the iso-degree-day lines throughout the eastern part of the country does not counter popular conception, but as soon as the eastern slope of the Rocky Mountains is approached, the influences of great natural factors is felt, and the failure of the lines to follow the extension of their general mid-continent direction is disconcerting, to say the least. Through the courtesy, and due to the visualized understanding of James H. Scarr, official-in-charge of the New York office of the United States Weather Bureau, the iso-degree-day lines on both slopes of the western mountains have been so located that they follow very closely the actual climatic conditions resulting from the prevailing winds and topographic features of the region.

The application of this map is, in its ultimate, almost unlimited. It was first designed to facilitate estimates of oil fuel consumption by representatives of oil-burner manufacturers. Knowing the amount of oil required to supply heat for 1 sq. ft. of steam radiation for a season of 1000 degree-days, it is only necessary to include a factor representing the estimated efficiency of the heating plant, and a simple operation in multiplication will give, with a high degree of accuracy, the quantity of oil required to heat a given house or building in any locality. By the same method, the number of tons of coal for any heating load may be computed, accurate within the degree of accuracy to which you can assign a heating value to the coal to be used. With gas, the application is simple and extremely accurate, as the heating value of gas may be readily determined with exactness.

By reversing the process, knowing the amount of fuel that has been consumed during the heating season, to maintain any given building at a fixed temperature, the *working* efficiency of the heating plant may be determined.

Other applications will suggest themselves, in almost every phase of the heating industry, and it is hoped that the data here submitted will be valuable, as well as interesting, to those engaged in this field.

Air Recirculating Practice in the Northwest

Evolution of System Providing Adaptability for Whims of School Boards

By Carleton F. Tweed

TEN years ago the writer came to the conclusion that ventilating engineers were making a serious mistake in not using recirculated air in connection with schools, and having reached this conclusion, proceeded to devise a system which would, through the use of automatic temperature control, deliver approximately 80% of recirculated air, mixed with 20% of fresh air, to the school rooms when the outdoor temperature was about 30°, which was the prevailing cold temperature used by designers in Minnesota, where the writer was working at that time.

Since reaching the above conclusion the writer has installed recirculated air systems in about fifty large schools throughout Minnesota, Iowa, North and South Dakota. Each of these schools is so arranged that all fresh air, all recirculated air, or a mixture of fresh air and recirculated air can be delivered to the school as may appear desirable to the parties in charge.

GENERAL ARRANGEMENT OF SYSTEM

Generally each system installed consists of two sections of 5⅝ in. Vento for primary ventilation, a Carrier Type-A air washer, two sections of 5⅜ in. Vento for secondary radiation, then a central fan which is usually motor-driven. From the fan the air discharges into a central plenum chamber, located under the corridor of the school, from which vertical risers are taken to the various rooms.

Each class-room has one supply opening and two or more vent openings. These vent openings connect to vertical ducts which are carried to a main vent chamber located in the attic over the top-floor corridor. To this vent chamber a number of revolving roof ventilators, also a cross-connection duct, or, as more commonly termed, a return-air duct, are run from the main vent chamber to connect with the fresh-air intake shaft, which always leads from the roof to the equipment located in the basement.

In this return-air duct a series of automatic louver dampers are installed and a similar set of automatic louver dampers are installed in the fresh-air intake, above the connection from the return-air duct. Also each outlet from the main vent chamber to the revolving roof ventilators is provided with an automatic louver damper. These three groups of dampers are then connected to a single thermostat which is located at the base of the fresh-air intake shaft and this thermostat is set for from 40° to 45°.

CONSTANT TEMPERATURE MAINTAINED AT BASE OF FRESH-AIR INTAKE SHAFT

It will thus be seen that the above arrangement of dampers provides that a constant temperature of from 40° to 45° is maintained at the base of the fresh-air intake shaft for all outdoor temperatures below the temperature for which the thermostat is set. Further, a careful analysis of the heat balance of the air will show that it is absolutely impossible to close the dampers at any time for the reason that the temperature in the main return-air duct is always 65° or more and therefore it is necessary for a certain amount of fresh air to always enter the system. A study will show that this percentage of fresh air is continuously increasing as the temperature outdoors rises above —30°, until finally, when the outdoor temperature is at 50°, the return-air dampers will be completely closed, and the fresh-air vent dampers will be wide open.

IMPORTANCE OF PROVIDING FOR ALL FRESH-AIR OPERATION

Knowing that school boards are constantly changing their members, we do not consider it advisable to plan our system of recirculated air so that it would not be possible to operate our system on all fresh-air should any of the members of the school board become convinced that recirculated air is wrong, and for this reason want to change over and use all fresh air. Also our arrangement permits the school board to experiment with the apparatus and so convince themselves that recirculated air is just as satisfactory as all fresh air.

PROVISION FOR ADDITIONAL BOILER CAPACITY

In planning the boilers for the school we install the boilers with just the capacity to handle the recirculated air system, but we do arrange our boiler room so that it would be possible to install additional boilers should the board at any time decide that they preferred to operate the system on all fresh air.

As a rule, in 30° weather outside, if two 100 H.P. boilers are required for the recirculated air system, four 100 H.P. boilers would be required for a system operating on all fresh air, and so, when you tell the school board that it would take two more boilers for an all fresh-air system, they are easily convinced that the recirculated air system is practical, and are willing to give it a trial.

In November and December, 1922, THE HEATING AND VENTILATING MAGAZINE carried a complete description of the high school at Virginia, Minn. This school has a total air circulation of 250,000 cu. ft. of air per minute, all of which, with the exception of that for the corridors and the swimming pool, is recirculated air. This was the first large school in Minnesota to be so equipped, and now practically all of the new schools in Minnesota, including Minneapolis and St. Paul, are operating on recirculated air.

This is the eleventh lesson of

The Heating and Ventilating Magazine's

New Home-Study Course in Gravity Steam and Water Heating

Instruction in this course is available only to subscribers of The Heating and Ventilating Magazine. The first lesson appeared in the November, 1924, issue. However, students can commence the course at any time. Immediately upon receipt of your enrollmen, Lesson 1 will be sent to you, together with the Work Problems pertaining to Lesson 1. Full directions will be included as to where to send your solutions of the Work Problems.

The complete course consists of not less than 30 lessons. The first five lessons are devoted to the fundamentals of heating and ventilation. The second section, commencing with Lesson 6, is devoted to gravity water heating. This will be followed in due course by sections on radiators and radiation, gravity steam heating, steam and water boilers and cost estimating.

The cost of the complete course, including a critical analysis of the Work Problems as solved by each student, is $80.00, payable in equal monthly installments of $10.00. An enrollment blank will be sent you upon request, together with full directions for securing all the benefits of the course.

Students who satisfactorily complete the course will be awarded a Graduation Certificate which will correspond in value to the character of the lessons themselves.

SPECIAL NOTICE—Effective September 1, the price of THE HEATING AND VENTILATING MAGAZINE'S Home Study Course in Gravity Steam and Water Heating is $100.00. This advance in the price of the course has been found necessary due to the amount of work involved in the handling of the lesson sheets and to the fact that each student is now supplied with the text and problem sheets in convenient loose-leaf form, arranged by colors for different parts and fully indexed for future reference. In this way each subscriber to the course who completes the lessons will possess a complete reference handbook which eventually will cover the entire field of heating and ventilation.

Lesson No. 11—Forced or Accelerated Water Heating Systems

*By Ara Marcus Daniels**

IN the first lesson of this course, devoted to Fundamentals of Heating and Ventilating, it was stated that the boiling temperature of water may be lowered by reducing the pressure. Conversely, by increasing the pressure, the boiling temperature of water may be raised. This is the principle on which closed or accelerated water heating systems function.

In Table H-6-1 are given the temperatures at which water will boil when heated under pressures varying by increments of 2 lbs. from atmospheric pressure (14.74 lbs. per square inch absolute) to a gage pressure of 25.26 lbs. per square inch. Thus, while the temperature of water, boiling in an open vessel, is 212.13° F. (usually called 212° F.), if the vessel be closed and the water subjected to a pressure of 25.26 lbs. per square inch, the temperature will rise to 267.2° F. before boiling commences.

When water is heated it expands, as explained in a previous lesson. In an open-type water heating system, the expansion of the water therein does not change the pressure to which this water is subjected (except to a very minor degree, due to increased static head). In a closed system, it is quite different. Expansion of the water results in compression of the air in the expansion tank unless the tank is omitted, thereby requiring that

TABLE H-6-1
RELATION OF BOILING POINT OF WATER TO GAGE PRESSURE

GAGE PRESSURE LBS. PER SQ. IN.	ABSOLUTE PRESSURE LBS. PER SQ. IN.	BOILING POINT °F.	GAGE PRESSURE LBS. PER SQ. IN.	ABSOLUTE PRESSURE LBS. PER SQ. IN.	BOILING POINT °F.
	14.74	212.13	13.26	28	246.4
1.26	16	216.30	15.26	30	250.3
3.26	18	222.40	17.26	32	254.0
5.26	20	228.00	19.26	34	257.6
7.26	22	233.10	21.26	36	260.9
9.26	24	237.80	23.26	38	264.2
11.26	26	242.20	25.26	40	267.2

TABLE H-6-2
RELATION BETWEEN HYDROSTATIC HEAD, PRESSURE & BOILING POINT

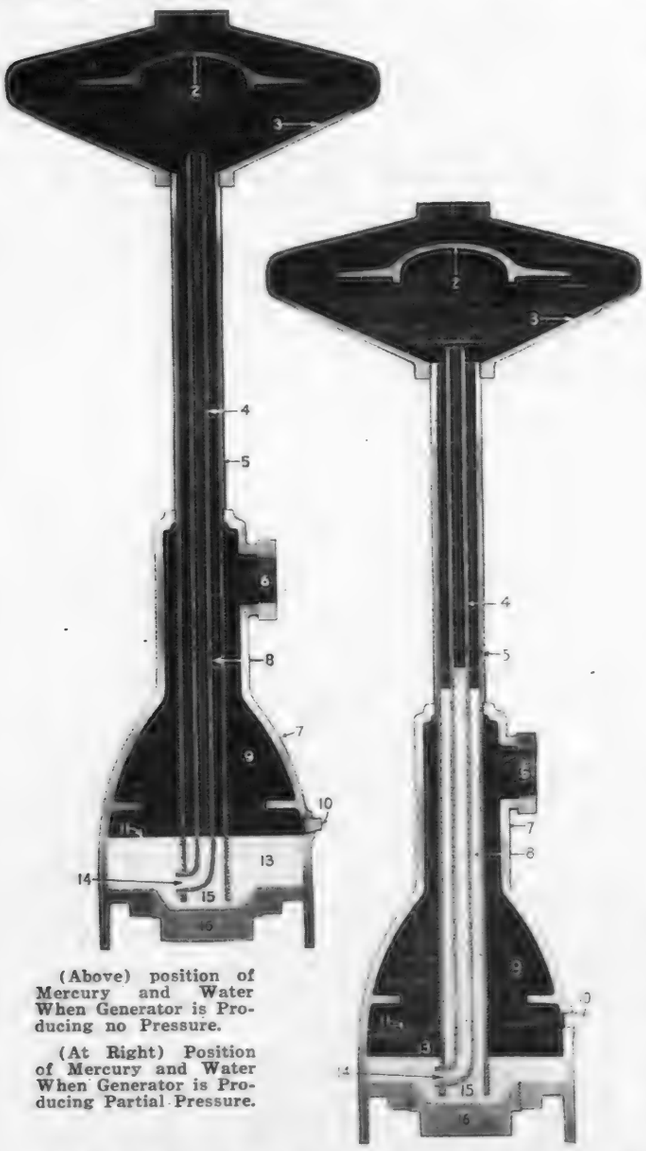
HYDROSTATIC HEAD - FT.	0	12	24	37	49	61	74	87	100	113	125
PRESSURE - LBS. PER SQ. IN.	0	5	10	15	20	25	30	35	40	45	50
BOILING POINT - °F	212	227	239	250	259	268	274	281	287	292	298

* *Copyright, 1925, Ara Marcus Daniels.*

special provision be made to release the expanded volume and replace it when the water cools and contracts; the compression of the air causes increased pressures throughout the system with consequent higher water temperatures.

Therefore the maximum temperature of the water obtainable in any water heating system depends upon the pressure on the system. In an open-tank system, the pressure at any elevation will vary with the distance below the level of the water in the expansion tank. Thus, theoretically, the water in the boiler can be carried at a temperature corresponding to the hydrostatic pressure at the boiler before boiling will occur. Practically, however, it is impossible to carry water in an open-tank system at a temperature in excess of 212° F. for the high-temperature water will rise into the open tank and boil there where atmospheric pressure exists.

Reference to Table H-6-2 permits a clear understanding of the relation between hydrostatic head or that due to the height of the water in the system, pressure, pounds per square inch, and corresponding boiling point.



(Above) position of Mercury and Water When Generator is Producing no Pressure.

(At Right) Position of Mercury and Water When Generator is Producing Partial Pressure.

Fig. H-6-1. Mercury Seal for Closed Water Heating System (Honeywell)

Work Problems H-6-1 and H-6-2

The ability to carry a higher water temperature in a closed system without possibility of boiling than in an open system argues well for the closed system of water heating provided all necessary precautions are taken and regularly observed.

Higher water temperature affords greater temperature range, greater flexibility of operation, supplies more heat units per hour per square feet of raditing surface, thereby permitting reduced size of radiators; and causes higher water velocities, thus allowing the use of smaller pipes, fittings and valves.

When a water heating system is sealed, thereby making it a closed system, it is essential that a safety or relief valve be provided, that it be set to operate at a nominal pressure, 10 lbs. per square inch in some systems and as high as 25 to 30 lbs. per square inch in other systems and, that it be examined frequently to see that it operates properly and at the pressure desired.

Special devices or valves are used with closed water heating systems so as to seal the system to the atmosphere and to maintain a pressure on it. The pressure increases until a predetermined value is reached or until the water reaches a predetermined temperature (depending upon the appliance used) when the device operates to break the seal, thereby automatically relieving the pressure and permitting the excess expanded water to pass either to the expansion tank or from the system.

Closed or accelerated water heating systems may be classified generally into three classes:

1. A system in which a special mercury container maintains a predetermined pressure on the system, with expansion tank located either at the high point of the system or in the basement.
2. A system in which a special damper control and relief valve are used to regulate the desired temperature of the water in the system, with expansion tank located either at the high point of the system or in the basement.
3. A system in which a special relief valve and reducing valve are used to maintain the desired pressure on the system and relieve and supply water from and to the system with an expansion tank omitted.

Work Problem H-6-3

MERCURY SEAL SYSTEM

The application of the mercury seal to water heating systems may be clearly understood by reference to Fig. H-6-1 and the following description:

When the water in the system is cold, the mercury 13 (illustrated at left) will all lie at the bottom of the mercury pot 7, about 1 in. in depth, and all other parts of the accelerating apparatus will be immersed in water.

By heating the water it expands and flows through opening 6 into chamber 7. The force of expansion is transmitted through the water volume

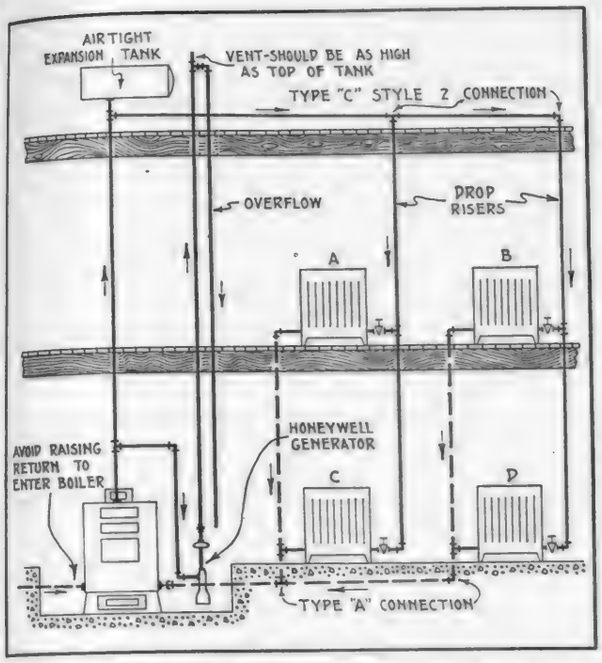


Fig. H-6-2. Typical Accelerated Down-feed Water Heating System with Air-Tight Tank in Attic. (Employing a Honeywell Generator)

9 to the top of mercury 13. This pressure forces some of the mercury through openings 14 and 15, into the circulating tube 4 and stand pipe 5 respectively (see center illustration, Fig. H-6-1). Continued temperature rise of the water results in further expansion with consequent rise of the mercury level in tube 4 and pipe 5 and lowering of the mercury level in the bottom of chamber 7, until the mercury seal at opening 14 is broken (see illustration at right, Fig. H-6-1).

This permits some water of volume 9 to pass into and up the circulating tube 4, carrying continually with it a small quantity of mercury. When this stream of water and mercury reaches the top of tube 4, the two substances separate; the water continues to rise, passes up and around deflector 2 and out opening 1 to the expansion tank; the mercury passes over the edge of tube 4 when it reaches the enlarged chamber 3 at top and falls through space 8 in the stand-pipe to inner mercury chamber 15 where it causes a raising of the mercury level in reservoir 13. This, in turn, governs the opening at inlet 14, thus acting similar to a balanced valve and controls the flow of water through circulating tube 4.

Under all normal working conditions, the positive circulation of mercury upward through tube 4 and downward through pipe 5 assures retaining the mercury within the circulating tubes of the apparatus, and establishes and maintains the desired pressure on the system (carried at 10 lbs. per square inch), while all water, in excess of that needed to produce an expansion force of 10 lbs. per square inch, is permitted to pass to the expansion tank.

As the water throughout the system cools, the action of the mercury and water in the apparatus is exactly reversed from the above explanation. As contraction occurs, the force of expansion gradually reduces so that the pressure acting on the surface of mercury in the lower chamber is reduced and a condition of unbalanced pressure occurs at openings 1 and 6, with the slightly greater pressure existing at opening 1. This pressure lowers the water and mercury level in tube 4 and pipe 5 until water may pass through openings 14 and 15, thence upward through the mercury 13, and mix with water volume 9 from where it may again flow into the heating system. The manufacturer of this apparatus states that "a pressure of ½ lb. at opening 1, causes water to flow from the expansion tank into the system."

Work Problem H-6-4

APPLICATION OF THE MERCURY SEAL TO WATER HEATING SYSTEMS

This means of accelerating the flow of heated water may be applied with the expansion tank in either the attic or basement. Fig. H-6-2 shows a typical layout with air-tight expansion tank for use when the tank is located in the attic and operates as a down-flow system. It should be noted that all radiator connections are made at the bottom. Fig. H-6-3 shows a typical layout with an open tank for a down-feed tank in attic system.

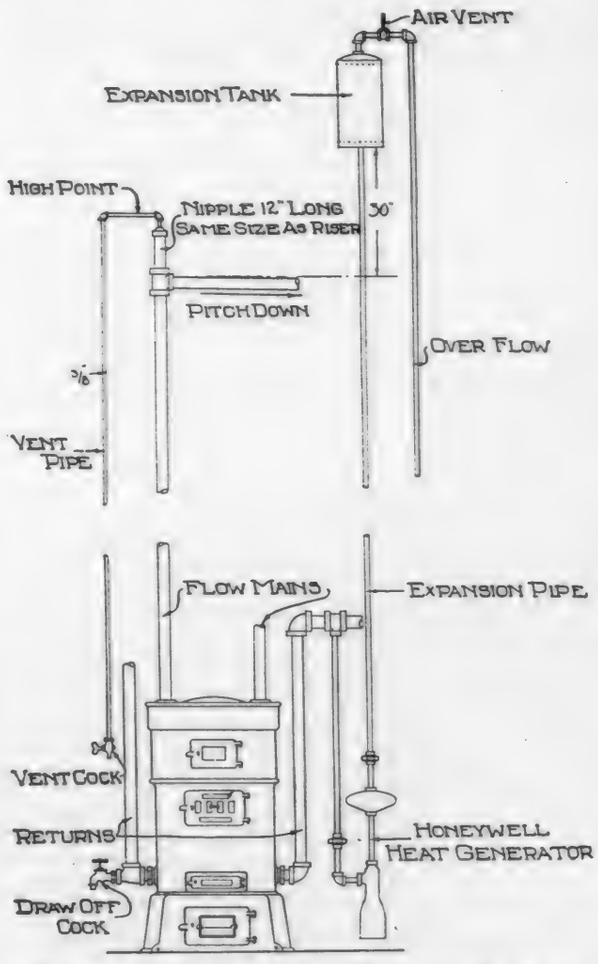


Fig. H-6-3. Typical Accelerated Down-feed Water Heating System with Open Tank in Attic. (Employing a Honeywell Generator)

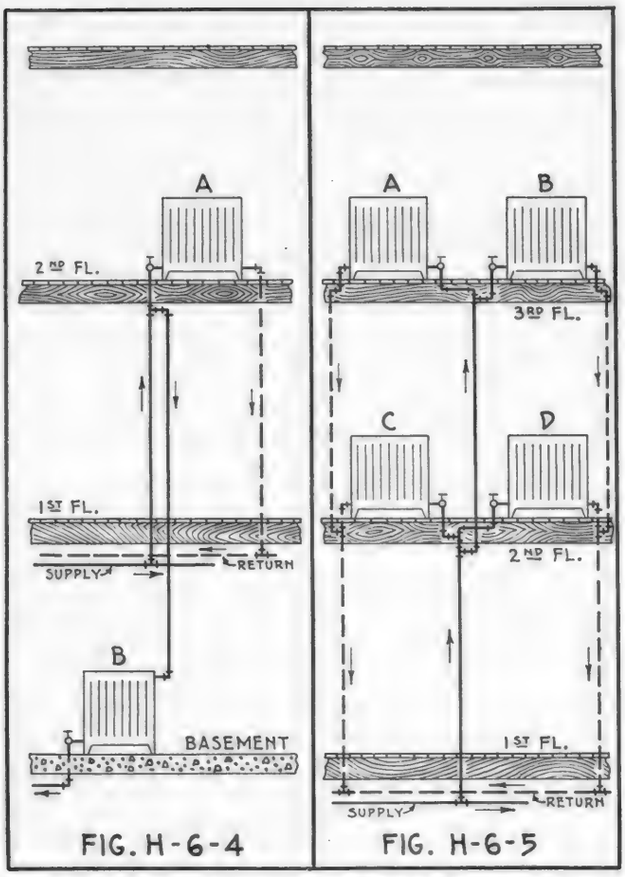


Fig. H-6-4. Drop Piping for Supplying Basement Radiator.

Fig. H-6-5. Riser and Radiator Connections for Second and Third Floor Radiators. (Used with Problem H-6-7)

Work Problems H-6-5 and H-6-6

PIPING DETAILS

The design of the piping should be carried out for any accelerated system with as much care as was stressed as being necessary for an open-tank system. Smaller valve sizes for equal radiation being permitted. Table H-6-3 is presented to be used for systems employing the mercury seal system described.

TABLE H-6-3
SIZES OF VALVES RECOMMENDED FOR A CLOSED WATER HEATING SYSTEM EMPLOYING A HONEYWELL GENERATOR

Radiator Location	Direct Radiation Square Feet	Valve Size
First Floor	Up to 30	½"
	From 30 to 60	¾"
	From 60 to 100	1"
Second Floor	Up to 40	½"
	From 40 to 100	¾"
	Over 100	1"
Third Floor	Up to 50	½"
	From 50 to 125	¾"
	Over 125	1"

The valve on the radiator at the end of the main should, generally, be made one size larger than the table indicates.

Risers should be made the same size as the radiator valve they supply except in the case of a ½-in. valve. No riser smaller than ¾ in. is recommended. Where a ½-in. valve is used on a second or higher-floor radiator, a ¾-in. riser should supply it. Also, when two radiators on a second or higher floor are supplied through ½-in. valves, a ¾-in. riser is considered ample. In general, the area of all risers should equal or exceed the total area of valves supplied. If one continuous riser is to supply a ¾-in. valve on a second-floor radiator and a ½-in. on a third-floor radiator, the riser should be 1 in. from the main to the second floor and ¾ in. from second to third floor.

A 1-in. riser to a second or higher floor should never be taken from a 1¼-in. main; nor a 1¼-in. riser from a 1½-in. main; nor a 1½-in. riser from a 2-in. main. The main should never be less than two pipes larger.

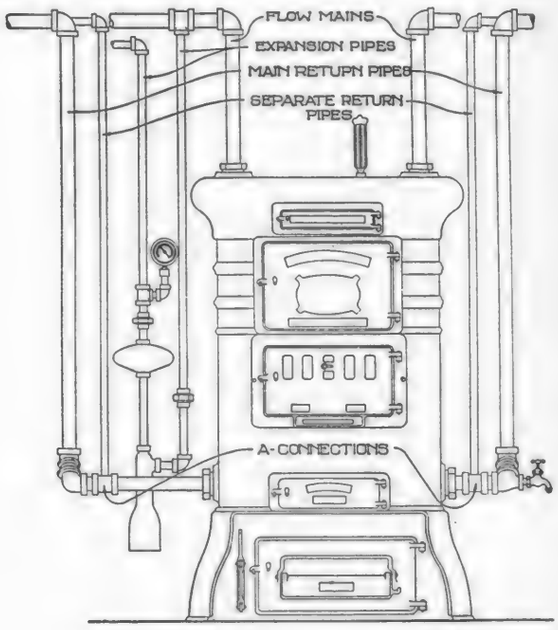


Fig. H-6-6. Method of Connecting Separate Returns into Main Return at Boiler

Long branches from mains to heels should be avoided and long runs between upper ceilings and floors should not be permitted. Additional and smaller risers should be used.

TABLE H-6-4
EXPANSION TANK CAPACITIES FOR USE WITH HONEYWELL GENERATOR

Radiation Sq. Ft.	Capacity Required Gallons
600 or less	21
600 - 1000	30
1000 - 1400	40
1400 - 2000	60

NOTE:- Two or more smaller tanks may be substituted for one larger tank.

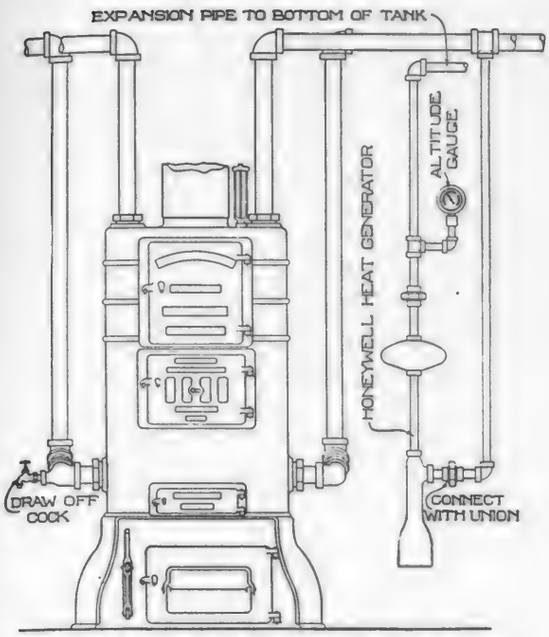
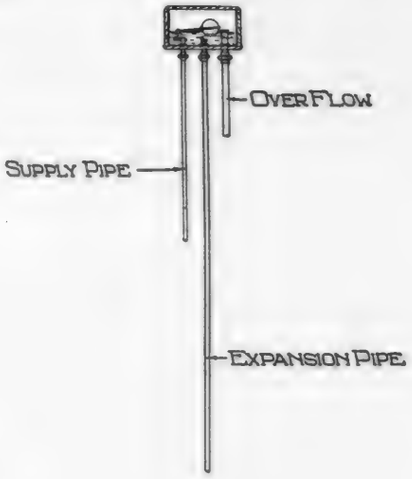


Fig. H-6-7. Method of Connecting the Generator to Mains at the Boiler

Work Problem H-6-7

Mains and branches should be proportioned by valve areas, as explained in a previous lesson. In general, they should be pitched ½ in. in 10 ft. No main smaller than 1¼ in. should be used. It is considered good practice to reduce mains up to 2½ in., inclusive, no more than one pipe size after leaving the boiler. More than one reduction may be made without danger of sluggishness where the main is 3 in. or larger. When a 1½-in. main leaves the boiler and reduces to 1¼ in., this size should be carried to the heel of the connection leading to the last radiator on the main. However, it is preferable to carry a main of this size to the end in order to avoid using a style B connection (Fig. H-2-2) and separate returns to the boiler, as shown in Fig. H-6-6.



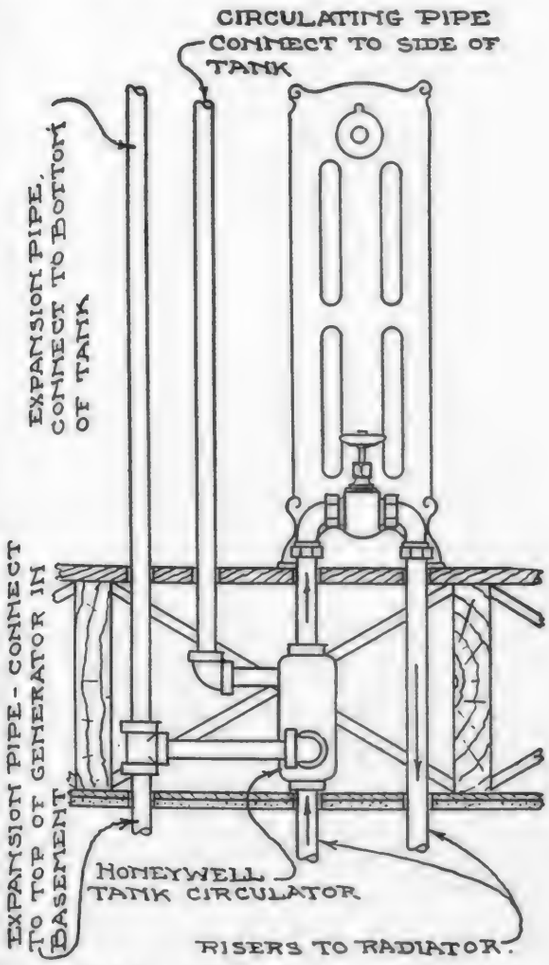

CIRCULATING PIPE CONNECT TO SIDE OF TANK
EXPANSION PIPE, CONNECT TO BOTTOM OF TANK
EXPANSION PIPE - CONNECT TO TOP OF GENERATOR IN BASEMENT
HONEYWELL TANK CIRCULATOR
RISERS TO RADIATOR

Fig. H-6-8. A Tank Circulator (Honeywell) as a Protection Against a Freezing Expansion Line

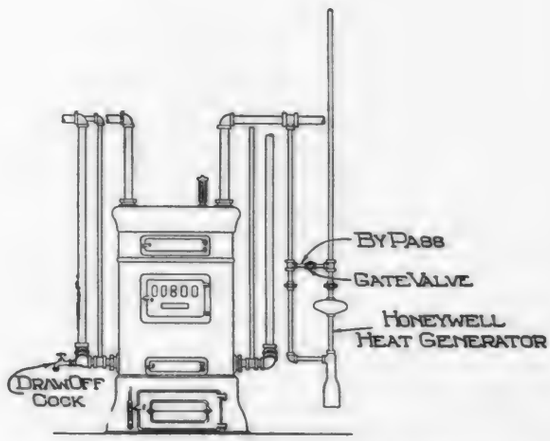


Fig. H-6-9. Application of an Automatic Expansion Tank to a Honeywell Generator Installation

The use of separate returns for radiators located near the boiler in a straight run up-feed water heating system, whether it be an open or closed-type system, is a most important consideration. Connections to the return header should be made as indicated in Fig. H-6-6 or, if the pipe is small, an extra hole may be drilled and tapped through the boiler shell. If connected into the return header, the necessary tee should be installed in the horizontal and not the vertical line, with side outlet in a horizontal position.

Work Problem H-6-8

A suitable manner of connecting up a basement

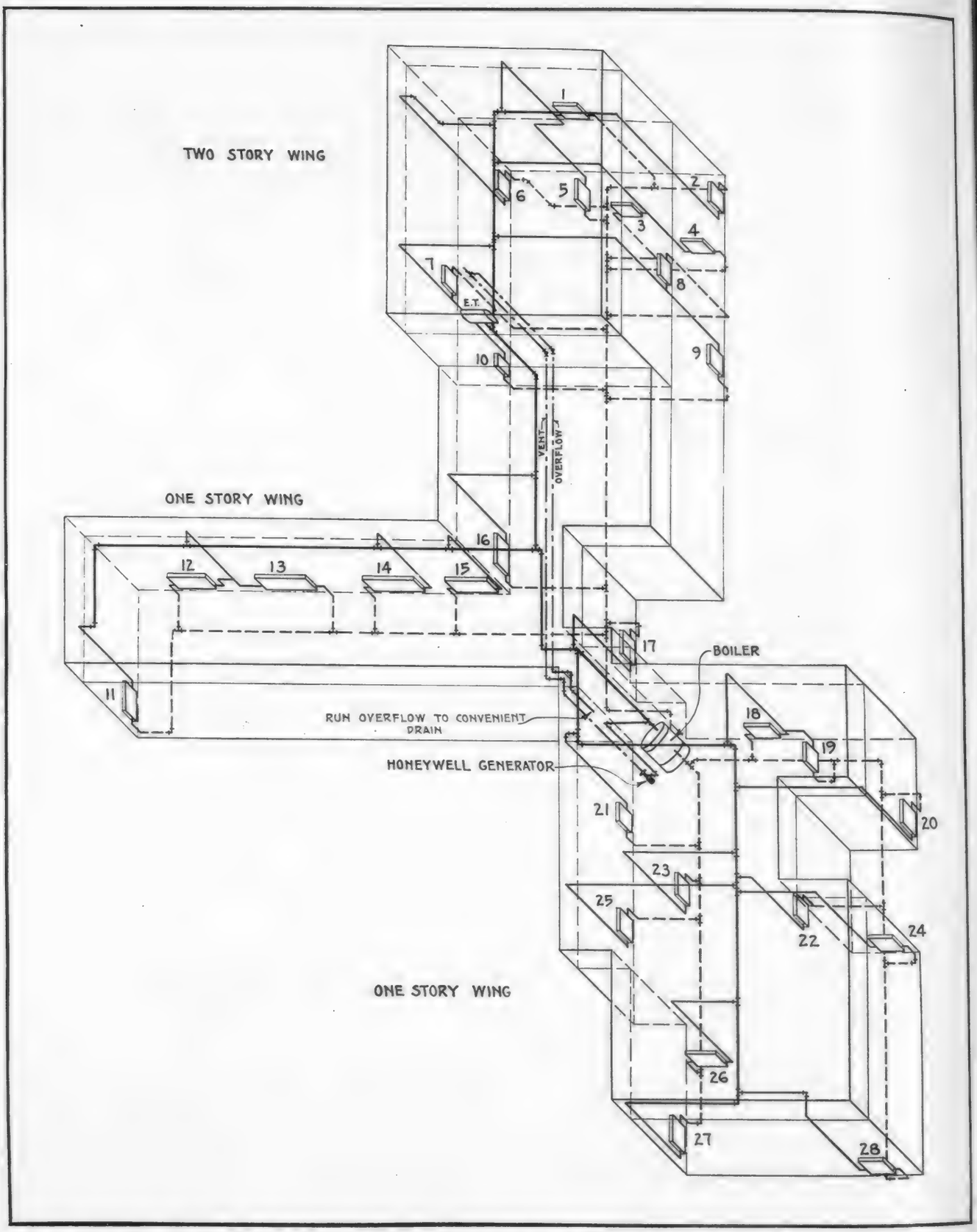


Fig. H-6-10. Application of a Honeywell Heat Generator to a Down-feed Water Heating System Designed for a Long Low Building
(Used With Problem H-6-12)

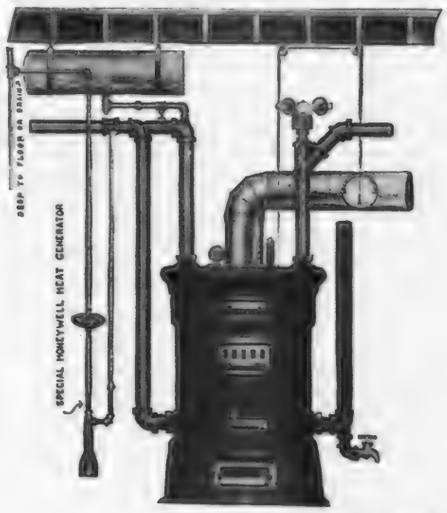
wall or floor radiator is shown in Fig. H-6-4, the drop pipe being taken from the nearest flow riser. A separate return to boiler should be installed and the supply riser from main designed large enough to supply all radiation.

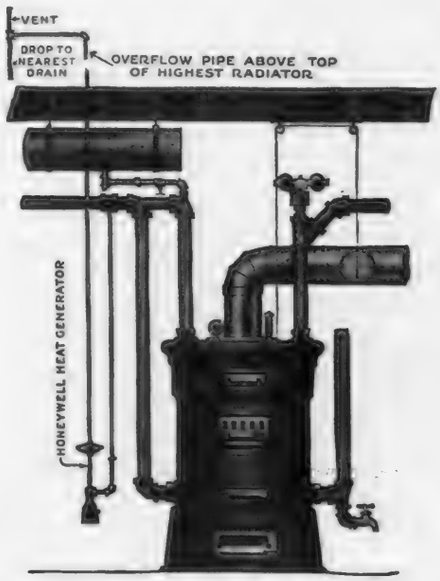
Work Problem H-6-9

Due attention should be paid to the manner of connecting branches to the mains, as was thoroughly covered in the second lesson devoted to water heating systems. (See Fig. H-2-2 and H-2-4 and accompanying description, May, 1925, issue.)

MERCURY GENERATOR CONNECTIONS

The mercury generator should be located preferably in the basement near the boiler with the side opening connected to a tee in any flow or return pipe, as indicated in Fig. H-6-7. While the generator is usually placed as shown, it will function equally well if located on first, second or a higher floor, provided it is installed so that there are at least 30 in. between the top of the generator and the bottom of the expansion tank. Unions as shown should always be used for connecting the generator to the system in order that it may be disconnected easily for draining all water from the system.





Figs. H-6-11 and H-6-12. Applications of Honeywell Heat Generator to a Tank-in-Basement System

ALTITUDE GAGE

The location of the altitude gage, shown in Fig. H-6-7, is preferable since by placing it in the expansion pipe and above the generator, the pressure produced in the generator will not be indicated on the gage and the exact height of water in the system will be registered.

Work Problem H-6-10

EXPANSION TANK AND LINES

The expansion tank should be installed and connected as explained in a previous lesson, so far as piping is concerned, and with an open tank, the size will be the same as for an open system. (See Table H-5-3.) When possible, the expansion line should always be run so as to protect it against freezing. Where this possibility cannot be entirely eliminated, a tank circulator may be used, as illustrated in Fig. H-6-8. Expansion tanks provided with a float valve for automatically introducing water into the system have certain advantages over the cylinder type as they may be installed where there is no danger of freezing and present a better appearance. Fig. H-6-9 shows method of connecting such a tank. If, however, an automatic tank is used, a by-pass should be provided for the generator as shown in Fig. H-6-9.

Work Problem H-6-11

APPLICATION OF A CLOSED SYSTEM TO HEATING LONG LOW BUILDING

Fig. H-6-10 shows a three-wing structure for which a down-feed closed water heating system is to be designed. The radiation being stated in the problem the student is to proportion all piping and submit on sheet provided.

Work Problem H-6-12

The mercury-seal generator may also be used with a tank-in-basement system where it may be preferable or necessary to locate the expansion tank in the basement, instead of above the radiation. A special mercury-seal generator is used. Figures H-6-11 and H-6-12 show the method of piping.

When a tank-in-basement system is designed, an air-tight expansion tank must be used. Table H-6-4 shows tank capacities for various size systems.

Regulation in a tank-in-basement system of this type may be accomplished by means of a Syphon water regulator whereby the heater drafts are controlled by the water temperature.

(Lesson No. 11 will be continued next month, and will include illustrations and descriptions of a temperature-controlled damper-regulating system, with relief valve, and a closed water heating system without tank.)

Halving Heating Costs with Central Station Steam

Notable Example of Economies Secured in Heating and Ventilating a Lodge Building

By Samuel R. Lewis

THE Springfield (Ohio) Masonic Temple is a very compact building, having all of its contents efficiently apportioned to some useful purpose, and necessitating considerable study on the part of the engineer to keep pace with the highly developed architectural design.

It was determined early in the working out of the project that central station steam would be used, as supplied by the Springfield Light, Heat & Power Company. The following report, made in June, 1923, was a factor in this decision:

"You have asked me to report on whether it will be more satisfactory to operate our own boiler plant or to purchase steam on a meter basis from the Springfield Light, Heat & Power Company. The following items seem to me to be entitled to especial consideration in such a study:

1. Would the heating be a by-product?
2. Have we space available for our own plant?
3. Is our load factor favorable?
4. Can we purchase steam at a reasonable price, and is the service reliable?

"1. When we have otherwise useless exhaust steam which can be used for heating, we effect a great economy, since the heating or the power can be considered a by-product. This is a comparatively small plant. The electric load is exceedingly variable, both with the season and during each day. There is no outlet for the considerable (relative) electric generating capacity required for lights, and this heavy investment will be earning its return only a fraction of the time. With our own electric-generating apparatus we would have to keep at least two engineers, who would be loafing most of the time.

"The Public Service Company is equipped to give electric service, and with its tremendous volume of business can equalize the periods of heavy demands from some buildings against the time of small demands from others. Actual figures based upon our estimated consumption of electric energy indicate a total average expense for our entire power and light demand of less than $300.00 per month. It is doubtful whether we could hire one competent engineer for this sum, to say nothing of two or three, and ignoring interest and depreciation on the investment.

"2. The building as planned utilizes every square foot of space for important activities. If we have our own boiler plant we must build it outside or underground, at heavy expense. Had we any unassigned space in the basement we might give consideration to the possibility of a boiler plant. Even a chimney of adequate size, running up through the building as projected, would be definitely an eyesore, and would occupy space of great value for other purposes.

"3. The building will be unique as compared with commercial buildings, in that it has very little glass area, has heavy walls, and in consequence has little heat loss when not occupied. It requires mechanical ventilation throughout, and in consequence has a heavy steam demand during the small part of each twenty-four hours that it is in occupied service. Thus we would, with our own boiler plant, have to keep large boilers ready but idle, say, twenty hours, to perform a four-hour service. This is a decidedly unfavorable load factor.

"4. The large plant in the building in which my own office is located sells steam to all of the buildings in the block, a common practice in Chicago. At present the price is around $1.25 per 1000 lbs. Compared with this the Springfield rate seem exceedingly reasonable.

"In order to estimate the probable cost of heating and ventilating, we must guess at the hours of occupancy for each department, since, though we may figure direct heat loss for twenty-four hours, ventilation will occur only during occupancy.

1. Average winter temperature 40° F.
2. Heat loss, —10° to 70° F.
3. Maximum heat loss is to actual heat loss as 2.67 is to 1.
4. Estimated actual square feet of direct radiation required 6,000 sq. ft.
5. To heat 1,000 C.F.M. from 40° (average) to 70° requires 33.7 lbs. of steam per hour.
6. Basement ventilating plant: 8 hours per day, 6 days per week, for 30 weeks. 15,000 C.F.M. required. 1440 hours. Total steam per season 728 M. lbs.
7. Ballroom ventilating plant: 4 hours per day, 2 days per week, for 30 weeks. 9,000 C.F.M. required. 240 hours. Total steam per season 72.6 M. lbs.
8. Lodges ventilating plant: 2.5 hours, 4 days per week, for 30 weeks. 14,000 C.F.M. re-

quired. 300 hours. Total steam per season 141.5 M. lbs.

9. Auditorium ventilating plant: 3 hours, 2 days per week, for 30 weeks. 25,000 C.F.M. required. 180 hours. Total steam per season 151.5 M. lbs.

10. Direct radiation for entire building: While we will not have anything like 6,000 sq. ft. actually installed, there will be a heat loss which must be made up by operating the ventilating systems, recirculating, or by overloading what direct we may have; or by intermittent heating, amounting to the heat which this amount of radiation would lose. We figure for direct radiation, then:

    6,000 sq. ft. at 0.3 lbs. for 210 days of 24 hours each, divided by the factor item 3 above (2.67), giving a total steam consumption for direct radiation and standby heating per season of 3,380 M. lbs.

11. Summary per season:

(6)	Basement	728.0 M. lbs.
(7)	Ballroom	72.6 M. lbs.
(8)	Lodges	141.5 M. lbs.
(9)	Auditorium	151.5 M. lbs.
(10)	Direct radiation.....	3,380.0 M. lbs.
		4,473.6 M. lbs.

12. On the basis of Springfield Light, Heat & Power Co. rates:

		At $0.70 per M.	At $0.50 per M.
October	6%....	268 M.....	
November	13	500 M.....	81 M.
December	18	500 M.....	305 M.
January	21	500 M.....	440 M.
February	17	500 M.....	260 M.
March	16	500 M.....	215 M.
April	9	403 M.....	
	Total....	3,171 M.	1,301 M.

Cost:

(a)	6,000 sq. ft. radiation at $0.04	$240.00
(b)	3,171 M. lbs. steam at $0.70...	2,219.70
(c)	1,301 M. lbs. steam at $0.50...	650.50
	Cost per season using public service...	$3,110.20

13. On the basis of our own plant:

    4,473,000 lbs. of steam per season, at over all efficiency of 50% for coal of 11,000 B.T.U. equals a consumption of 407 tons of coal per season.

    We will require: for direct radiation 60 H.P.
    for ventilation....189 H.P.

    Total connected load.....249 H.P.

    Say, two 100-H.P. boilers. These will cost at least $50.00 per H.P. installed, or $10,000, counting auxiliaries not needed with public service steam. The boiler house and chimney will cost not less than $10,000 in addition to this.

Cost:

(a)	407 tons coal at $7.00 deliv'd..	$2,849.00
(b)	15% interest and depreciation $20,000 investment	3,000.00
(c)	Labor, one fireman, per season	1,200.00
	Cost per season, using our own boilers	$7,049.00

"These figures are exceedingly interesting, and no one could be more surprised than I was at the outcome. I cannot find anything which promises to be wrong to an extent sufficient to change materially the results. We might have under-estimated the item 4, but if we were off 50% it would add less than $700.00 to item 12. We might have over-estimated the coal tonnage, but if this proved to be only 300 tons at $6.00, item 13 would be reduced only to $6,000.00.

"It seems to prove that we have a building peculiarly adapted to heating by a public service company, and that we are offered a favorable contract which relieves us and shifts to the company an unfavorable load factor."

In the October issue Mr. Lewis will describe in detail the heating and ventilating equipment for the Springfield (O.) Masonic Temple and will show several of the floor plans and details.

Notes on Figuring Indirect Heater Performance

A USEFUL rule for figuring indirect heater performance, given by W. H. Carrier, is that roughly an increase of five times the pressure equals twice the heat transfer.

In a discussion of this subject which followed the reading of a paper on "A Proposed Method for Comparison of Effectiveness of Indirect Heating Surfaces," before the American Society of Heating and Ventilating Engineers, Mr. Carrier made the statement that there is no way to compare indirect heaters on a velocity basis.

"With a heater of unusual shape," he stated, "you have airways varying all the way through the heater. The velocity at the point of minimum contraction does not mean much, because effective velocities are often at points of considerably greater area.

"Velocity does not mean anything unless it be through a plate-type of heater with a uniform spacing, or through a tube heater, with a uniform cross section, but the majority of heaters do not have any such uniform airways.

"It is very common to hear 'this is a heater with a certain velocity that will give you twice the transmission of another heater.' When you come to analyze the matter, the unit in question may have four or five times the resistance for the same velocity, while with the other heater you could raise the velocity and get the same temperature difference. With a tube heater you will need a considerable higher velocity to get the same heat transfer, but that does not mean that it is a poorer heater."

House-Heating by Combining the Use of Gas and Oil

By Henry O. Loebell

Vice-President and General Manager, Combustion Utilities Corporation.

UP to the present time coal has been considered as the standard or the most practical and desirable fuel for househeating purposes. Within the past few years, however, a great many installations have been made using either gas or oil and the progress that is being made in using these fuels is becoming so noticeable that we may well wonder what the outcome will be and which fuel will be ultimately used to fulfill this important function of heating the home.

A desirable fuel for househeating should have the following characteristics:

1. Cleanly.
2. Adequate in supply.
3. Reasonable in cost.
4. Adaptable to automatic control.

Civilization in its progress is laying more and more stress upon the factor of cleanliness. The average individual is becoming more and more cognizant of the detrimental influence of smoke, dirt, ashes and general unsanitary conditions and we find that today the home owner is willing to pay a distinct premium for any fuel or method of heating which will give him greater comfort under more sanitary conditions.

Adequacy of fuel supply is of paramount importance because the well established law of supply and demand must be satisfied. We can only continue to have an ample supply of a fuel available at a reasonable price just as long as there is a large potential supply to meet the demands of the American public. The price at which fuel can be purchased must be within the economics of the average household. While the customer is willing to pay a certain premium for desirable fuels, it is obvious that such premiums must be within the household budget allowance of the average home owner.

Labor saving is a part of the present age. The public is vitally interested in any method of househeating which does away with the disagreeable problem of furnace attendance and is of such a nature that the house is automatically kept at the temperature of comfort during each hour and day of the entire heating season. The customer is willing to pay for the service rendered by the so-called "invisible furnace man" or automatic method of househeating.

We may consider coal, oil and gas as the three major fuels available today for househeating. Each of these fuels has desirable and undesirable characteristics and any prophecy as to what fuel will be used in our ultimate system of househeating involves careful analysis of the pros and cons relative to each of these fuels. While soft coal can be purchased at a reasonable price, it cannot be considered as a desirable househeating fuel because of the dirt and general uncleanliness involved in its utilization. Hard coal costs 2½ to 3 times more to mine than soft coal, and today at its present high price in conjunction with the poor efficiency that can be obtained in its utilization, it is actually a very expensive fuel which involves the services of a furnace man to utilize it, and at the same time it is not adaptable to the application of automatic temperature control equipment to the same degree as are fluid fuels.

Oil as a househeating fuel is gaining ground very rapidly. It has many distinct advantages over coal which make it a desirable and acceptable fuel. It is available today at a reasonable price and can be readily used under conditions of automatic temperature control. A careful analysis, however, of the supplies available for a long period of time indicate that there may be a serious limitation to the use of oil as an ultimate househeating fuel.

PRODUCTION OF OIL AND ITS USES

The homes in this country consume annually an amount of fuel of all kinds, which is equivalent, on a heat content basis, to some 550 million barrels of oil. Our total production of oil last year amounted to approximately 700 million barrels and our leading geologists believe that this represents a maximum production which will gradually decline in the coming years. Of this 700 million barrels, approximately 350 million barrels are utilized in supplying gasoline, kerosene and lubricating oils. Of the balance, approximately 150 million barrels consists of exceptionally heavy fuel oils such as bunker fuel oil which is used for ships. This oil involves difficulties in its utilization and is not readily adaptable for househeating purposes. This leaves only approximately 200 million barrels which would be available for househeating providing we could discontinue supplying any of this oil to the many industrial uses to which it is put today.

It is therefore apparent that the available supplies of fuel oil in this country are not sufficient to allow us to consider oil as the ultimate househeating fuel. While it is true that sufficient quantities of oil can be obtained from our enormous shale oil beds, it is also true that if we were to use this source of supply, the price would be appreciably higher than it is today and it would therefore be undoubtedly more economical to use some other available fuel.

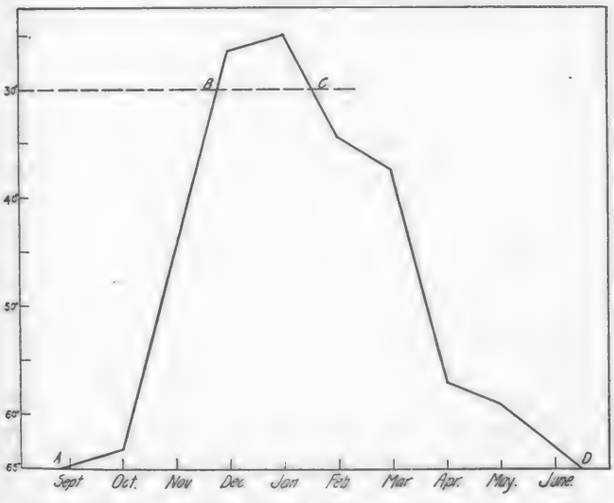
GAS THE BEST FUEL, LIMITED BY PRICE

Gas is by far the most desirable fuel for house-heating. The fact that it is delivered by pipe line into the customer's premises, is absolutely clean in its combustion, can be utilized with the highest possible efficiency, together with the ease with which it can be used with automatic temperature control equipment, makes gas a premier fuel.

There is only one limitation to the use of gas as an ultimate househeating fuel and that is the question of price. The price of gas as a househeating fuel must necessarily be high because the overhead charges involved in supplying gas for househeating purposes are unusually high. The reason for this is that during the extremely cold weather there is an enormous demand for gas for househeating, while in the early and late months of the heating season, this demand is appreciably less, so that the so-called load factor of utilization is extremely poor. Therefore the investment cost for plant generating capacity and distribution facilities are extremely high for every thousand feet of gas supplied.

CHARACTERISTIC HOUSE-HEATING LOAD PROBLEM

In the accompanying chart we have a characteristic curve of the househeating load. This particular curve is for Kansas City, Missouri, during the winter of 1924. The curve shows the mean monthly temperatures for each month of the heating season. In September the average outside temperature was approximately 65° F. In October it was 63° F. In December and January the temperature had declined to approximately 25° F. and gradually arose during the following months, until in May the temperature was again at 60 to 65°. Since the rate at which gas must be burned under the boiler is directly proportionable to outside temperature conditions, the accompanying curve definitely indicates the rate at whch fuel must be supplied during each month of the heating season. During the month of October the amount of fuel to be supplied is practically nil, while during the month of January it is necessary to supply between 20 and 25% of the total fuel.



Curve of House-Heating Load in Kansas City, Mo., During Winter 1924-1925 Showing Mean Monthly Temperatures.

The househeating load is an extremely poor one and it makes it expensive to endeavor to use any fuel which involves high overhead charges where a high rate of production is necessary for only a short period of time.

In analyzing our fuel situation we find that oil is a desirable fuel for househeating but that its supply is limited. At the same time gas is an ideal fuel but its price is prohibitive, not because of its cost of production, but because of the high overhead and investment charges necessary on account of the extremely high demand for fuel during the months of December, January and February. It is a recognized fact that if the load factor of the heating season could be improved, the price at which gas could be sold would be well within the economics of the average home owner and that gas would become the ideal and ultimate househeating fuel.

The question immediately arises therefore whether it is not possible to utilize gas for the great bulk of the time of the heating season when outside temperatures are not extreme so that the load factor of gas utilization would be high and the cost at which it could be sold would be relatively low. Under such a condition is it not possible to use gas during the warmer weather and when the extremely cold weather comes to use some other fuel to supply the so-called peak demand conditions which occur only for a relatively short amount of time of the heating season? With oil as a desirable househeating fuel and available in appreciable quantities, cannot oil be used as an auxiliary fuel to supplement the use of gas.

APPLICATION OF THE DEGREE-DAY

An index as to the quantity of fuel necessary to heat a home in any particular community can be obtained by knowing the number of degree days of the heating season of that particular community. A degree day is a unit of heat requirement and is the product of one degree differential between the inside temperature of the house and the outside temperature, multiplied by the period of a day. The number of degree days of heating required in the locality of Kansas City, Missouri, is approximately 5200. In the accompanying chart this number of degree days is indicated by the space within the curve and is the product of the difference between the outside temperatures subtracted from 65° F. (which is assumed to be the average inside temperature of the house) by the number of days in each month. Adding the number of degree days for each month we have the total number of degree days for the heating season, which in this particular case is equal to 5200. The horizontal dotted

line divides this number of degree days, 5200, into two amounts. First that amount of degree days which are occasioned when the outside temperatures are above 30° F. and that amount which takes place when the outside temperatures are below 30° F. A study of the chart reveals the fact that of the total number of degree days, namely, 5200, approximately 5000 occur under conditions when the outside temperatures are above 30° F. and only 200 or approximately 4% when outside temperature conditions are below 30° F.

EFFECT ON GAS LOAD-FACTOR OF DUPLEXING OIL AND GAS FUEL

To heat the home from 30° to 65° F. requires only one half the rate of supply than that amount necessary to heat the home from minus 5° F. to 65° F. In this particular case if the home required a 200′ gas demand where gas was used entirely, only 100′ gas demand would be necessary to heat the house when temperature conditions are as low as 30° F. Under these conditions where we only require one half of the gas demand we would at the same time serve the customer to the extent of 96% of his heating requirements. Under these conditions we improve the load factor of utilization approximately 100% and the price at which gas could be sold would be appreciably less than it is at present, where gas is used entirely for househeating. When the temperature is lower than 30° F. we could use oil as an auxiliary fuel. While this oil would be sufficient to take care of the large peak demands occasioned during severe weather conditions, the total quantity consumed would only be very little representing, only 4% of the customer's requirements. This 4% would only amount to 50 to 100 gallons of oil per customer for the season, in comparison with an average amount of 2000 gallons per customer for the season which is the amount used at the present time where oil is used entirely for househeating.

It is believed that an analysis of the limitations involving the use of gas and oil for househeating definitely lead to the conclusion that the proper and ultimate method is to use a system which combines the use of gas and oil—which uses gas as a base load fuel and uses oil to supplement this gas supply when the weather is extremely cold. Such a system will allow our gas companies to sell gas at prices which will make the use of gas sufficiently economical so that it can be used by the average home owner and at the same time we use oil to advantage in limited quantities which will not involve a total consumption greater than that which we can expect from our petroleum resources for many years to come.

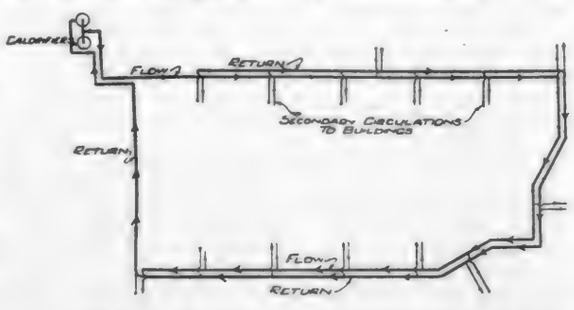
An equipment which combines the use of gas and oil in the manner described above has been perfected, and, under the name of the Doherty gas and oil burner, will be placed upon the market through the House-Heating Division of the Combustion Utilities Corporation, one of the Henry L. Doherty interests.

Design and Arrangement of Mains for Hot Water Supply

THE first consideration, and one of paramount importance in a central hot-water supply or heating plant is the design and arrangement of the mains. I am opposed to what I call a "branch-tree arrangement." In my opinion, such an arrangement of piping, with flow and return pipes laid from the calorifier chamber, passing out side by side, and then branching out into various secondary circulations, and these in their turn again branching into other subsidiary circulations, is simply bristling with potential trouble in the form of short circuits and unequal temperature distribution. Wherever such an installation has been installed, the complaints were generally many and continuous, in respect of the low temperature of the water drawn off at the ends of the circulations.

My experience of hot-water apparatus for large institutions leads me to advocate unreservedly the adoption of circulating mains erected upon what I call the "Bridged System." This arrangement has without exception proved an unqualified success in all cases where it has been installed. As an illustration, I would draw your attention to Figs. 1 and 2. In Fig. 1 you will see set out a typical "Branch Tree System" and in Fig. 2 the "Bridged System."

The branch tree system is not only fundamentally bad, but very often misguided efforts to improve matters produce worse evils. In many cases where the branch tree system has been installed, and the complaints of unequal distribution of water have been continuous, the resident engineer, after vainly endeavoring to obtain by valve regulation an even temperature distribution of the water to all the draw-offs in the institution, has generally tried to remedy the matter by what he calls "forcing the apparatus." He proceeds to raise the temperature of the water in the calorifiers to 180° or even 200° F. in the hope that the complaints will cease, and where heretofore with water in the calorifiers at 130° to 140° F. and water at 100° or even less has been drawn off at some points, he now succeeds in producing water at 120° to 130°, and this has often happened, but adds very considerably to the run-



IDEAL LAYOUT OF FORCED CIRCULATION HOT WATER SUPPLY OR HEATING MAINS

Standardization of Furnace-Oil the Pressing Need of the Day

By O. P. Keeney
President, Oil Trades Association of New York.

IT is estimated that last year over 4,000,000 tons of coal were replaced by oil for household heating.

The consumption of furnace-oil for domestic heating is already a real factor and seems likely to become an increasingly important factor in the petroleum industry.

At the present time furnace-oil is far from being a standardized uniform product, as the petroleum industry has been called upon to furnish fuels suitable for any type of burner which any manufacturer saw fit to make and sell. This has resulted, undoubtedly, in limiting the available supply, creating unnecessary complications for the oil distributor and adding to the expense for the consumer. Both from the standpoint of the refiner, the burner manufacturer and the consumer, it is highly desirable that varying and unnecessary specifications for furnace-oil be eliminated.

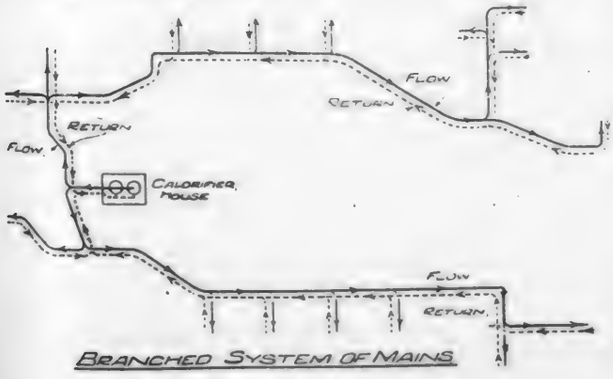
Certainly to secure the co-operation of the petroleum industry in furnishing an adequate supply of furnace-oil at the lowest price, it is desirable that the oil burners should be capable of using the widest possible range of products.

ning charges, in waste of fuel and in an excessive throw down of lime, etc.

I have not met any such condition where the bridged system has been installed.

From the diagram in Fig. 2 the arrangement of the bridged system will be quite clear, and I will only point out that in this system you have the unusual condition of both flow and return water circulating in the same direction through the subways. There is no potential short circuiting path, the whole of the water circulated must pass right round the complete run of the subways, and if care has been exercised in designing the secondary circulations, so that the inches of water column frictional head are nicely balanced, the system results in a practically perfect and equal distribution of water to all the draw-off points. In all such cases, with an initial temperature of water in the calorifier at 140° F., I have found that the variations in the temperature of the water from all the draw-offs in any one institution only varied 10°, viz., from 125° to 135° F.

This system should invariably be adopted wherever the installation is practicable. This is always so in the case of a new institution, where the arrangements of the pipe subways and trenches can be laid down to suit the requirements of the plant, and even in conversion of old installations, it is in many cases possible to install a modified arrangement of this bridged system by an addition to the trenches.—HERBERT G. CATHCART, *before the Institution of Heating and Ventilating Engineers.*



BRANCHED SYSTEM OF MAINS

How They Save Fuel in Kansas

(*Continued from Page* 65)

decide that they preferred to operate the system on all fresh air.

As a rule, in —30° weather outside, if two 100 H.P. boilers are required for the recirculated air system, four 100 H.P. boilers would be required for a system operating on all fresh air, and so, when you tell the school board that it would take two more boilers for an all fresh-air system, they are easily convinced that the recirculated air system is practical, and are willing to give it a trial.

In the ten years that we have been designing this type of system we have as yet to receive our first complaint that the system was not satisfactory, or that the automatic temperature control did not function properly.

In November and December, 1922, THE HEATING AND VENTILATING MAGAZINE carried a complete description of the high school at Virginia, Minn. This school has a total air circulation of 250,000 cu. ft. of air per minute, all of which, with the exception of that for the corridors and the swimming pool, is recirculated air. This was the first large school in Minnesota to be so equipped, and now practically all of the new schools in Minnesota, including Minneapolis and St. Paul, are operating on recirculated air.

Some of the larger and more important schools designed by us include the following: Junior High School, Chisholm, Minn.; North High School, Omaha, Neb.; Junior High School, South St. Paul, Minn.; and the South High School, Omaha, Neb., now under construction.

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DUE to the advances in the gas industry, the rapid rise of oil heating and the intensive efforts being made to adapt small-sized anthracite to domestic use, the past year has witnessed perhaps the most significant developments to date in the conservation of fuel. In spite of the many telling arguments of the coal men against oil heating and in defense of coal as the ideal available fuel, their concern over the inroads of oil crops out at many points. The gas bugaboo has had fewer terrors for them as it was felt the gas industry faced an insurmountable obstacle in the form of an impossible peak demand which would run their equipment and maintenance costs literally out of sight. But here, again, a bogey is arising from an important source in the shape of a combination gas and oil heater designed to operate most of the time on oil, but to switch to gas automatically in extreme weather. By this means, say the gas men, the peak gas load will not only be flattened, but will actually sag, making it possible to increase the industrial gas load at the time of the greatest house-heating demand. To assure the operation of gas-oil heaters on the desired basis, the plan further involves remote control from the gas plant of certain sections of a community so that the switch-over from gas to oil will be at all times in the hands of the gas company. A description of such a system, accompanied by data covering a year's operation of a gas-oil heater in a Long Island residence, will appear in an early issue of THE HEATING AND VENTILATING MAGAZINE.

TO many in the gas industry the development here described is considered such a master stroke as to place the heating field practically in their hands. Other things being equal, it is argued, where else can we find the organization, the distribution and the financial strength necessary to "put over" so broad a program on a scale commensurate with its possibilities?

Well, there is this to be said. The heating industry as such has never attained that settled status characteristic of mechanical engineering or, to take a more striking example, of electrical engineering. It has been, and still is, in a fluid state. Both in the development of methods of heating and in the radical changes in ventilating practice, the industry has experienced all the vicissitudes which are associated with the different ages of man.

Fundamentally, it makes little difference to the industry whether the source of heat is coal, gas or oil. Whatever course is set, the industry will steer by that course. Most of the important boiler manufacturers are prepared even now to furnish heaters for any one of the three major fuels on the market.

NO ONE, however, who seriously studies the present situation, can mistake the fact that the heating industry is entering the most important era in its history. From a comparatively minor profession, the field is rapidly broadening to become as wide as those branches of the coal, oil and gas industries which have gone in for domestic heating. That is to say, the new elements that are coming into the field are not merging their identities with what we know as the heating and ventilating industry but, on the contrary, are forming a separate branch of it on a large scale. The men who are specializing in gas and oil for domestic use must perforce become heating and ventilating engineers. There is evidence on every side that they appreciate this necessity. There is a thirst for heating engineering data from sources hitherto unknown to the industry which is reflected in the growing demand for information on past and present practice.

If we read the signs of the times aright, the man who fails to take cognizance of the new era which is already upon us, and who fails to acquaint himself with the facts regarding oil and gas is likely to find himself in the ruck in the rapid march of events. But having that information and acting upon it, we believe he has nothing to fear from the influx of new blood. Growth is almost always a good sign. There is plenty of room for all. As a heating man sagely remarked recently, in discussing the industry's prospects, "We are almost at the end of the first generation of modern heating systems. The second generation has arrived with all its opportunities for renewal installations, as well as for strictly new work."

The Wisconsin Code as a Model for Other States

What the Leaders of the Industry Have to Say on The Heating and Ventilating Magazine's Proposal

A SUGGESTION made last month by THE HEATING AND VENTILATING MAGAZINE, that the Wisconsin Heating and Ventilating Code be used as a model for adoption by other States, has met with some interesting reactions on the part of representative men in the industry. (The code was published in full in THE HEATING AND VENTILATING MAGAZINE for May, June, July and August, 1925.)

Following are some of the comments received:

From F. R. Still—"Mr. Lewis has covered the matter in a very comprehensive way. There is one point which he failed to bring out regarding the American Society of Heating and Ventilating Engineers' Code, and which is worth mentioning as it places a distinct value on that code which must be understood in order to particularly distinguish the difference between it and the other two codes he mentions.

"The code developed by the society is intended to be a Code of MINIMUM REQUIREMENTS; in other words, common practice may allow of expansion of apparatus above the code requirements, but nothing should be provided that will be of less capacity than the code requires.

"The other two codes he refers to are intended to cover common practice, and do not establish minimum requirements as does the society's code.

"As he says, the society's code is really a text-book, and wherever experience in various sections of the country has shown that prevailing conditions will make it necessary to enlarge any piece of apparatus to meet the requirements of that particular section, those who have to use the code are at liberty to expand it to any extent that may be necessary, but under no circumstances should apparatus be installed which is not of the capacity intended to be covered by this code."

From E. Vernon Hill—"I have carefully gone over Mr. Lewis's article and your editorial regarding the situation as to ventilation standards. I have followed the drafting of the original Wisconsin code with considerable interest and also the revisions which bring it to its present form, as printed in THE HEATING AND VENTILATING MAGAZINE, and I wish to state frankly that I cannot agree with your recommendation for the industry and profession to get behind the Wisconsin code and use it as a model.

"The Wisconsin code is open to the same objection we urged against all other existing codes that are now usually referred to as 'antiquated' and 'obsolete.' The fundamental error has been committed in the Wisconsin code as in the other codes; namely, specifying *how* results are to be obtained, rather than what conditions are to be maintained. For a code to say how a room should be ventilated is absolutely wrong. It is unconstitutional, unscientific and unjustified.

"There are no requirements anywhere in the Wisconsin code that operate directly to protect the health and comfort of the occupants of mechanically-ventilated rooms. I do not wish to be misunderstood regarding this matter. I believe, as a set of regulations for the guidance of engineers or for the assistance of municipal authorities in enforcing ventilation requirements, the Wisconsin code is the best that has been produced, but it never should have been enacted into law, as it deals with methods rather than results.

"The action of the American Society of Heating and Ventilating Engineers at the Atlantic City meeting in adopting its code as a compendium of modern practice, was a blunder that must be corrected. I can speak plainly on this subject as I was present at the meeting and approved the action taken. Later and more careful consideration of this action, however, convinces me that the society does not need and has no excuse for a compendium of modern practice. It does need and must have a code.

"The action taken at the Atlantic City meeting was the easiest way out of a difficult situation, but the easy way is seldom the right way. The Code Committee should be continued, conflicting ideas and practices should be ironed out, and the code adopted as a code, with the least possible delay."

From H. W. Page, vice-president and general manager, Bayley Manufacturing Company—"It is highly desirable that all States adopt a code on heating and ventilation which will not only be intelligent and comprehensive, but as nearly similar as local conditions will permit. It is obvious that Wisconsin with its cold winters cannot write a code that will apply in Florida.

"The code of all States, however, should be founded on the same general scientific and engineering principles, pertaining to heating and ventilation. Such codes should be flexible so far as betterment is concerned, so that they may progress with the knowledge of the art. They should be inflexible so far as permitting deviation from well-known good practice.

"The various associations and societies of engineers have established 'codes' or rather rules of up-to-date procedure. Manufacturers must adopt 'codes' or 'rules' standardizing ratings and be prepared to certify that their ratings are in conformity with standard practice. Then, with State codes establishing fundamental requirements, the engineering fraternity will be better able to assure a 'job' that the owner will be well pleased with."

Tests Show Possible Savings in Burning Buckwheat Coal

Some impressive coal-saving figures are submitted in connection with a coal burning test in which the coal used was rice, burned on a grate of the Pyramid type, as made by the Pyramid Iron Products Corporation, New York. The figures as obtained in three installations are contained in the accompanying table:

	Carteret Club, Jersey City, N. J.	Rutherford, N. J. High School	Rutherford, N. J. Park School
Without Pyramid Grates			
Coal Burned (1923-24)	Egg 201 tons	Egg 250 tons	Egg 135 tons
Cost	$2859.49	$3375.00	$1822.50
With Pyramid Grates			
Coal Burned (1924-25)	Rice 156 tons	Rice 190 tons	Rice 105 tons
Cost	$993.78	$1045.00	$577.50
Saving	(24%)	(24%)	(22%)
Tonnage	45 tons	60 tons	30 tons
Money Saved	$1866.71	$2330.00	$1245.00

The above installations, made last summer, paid for themselves in savings before January 31, or in less than one heating season.

Vacuum Steam-Heating System Patent

One of the legal decisions published in THE HEATING AND VENTILATING MAGAZINE for June, 1925, referred to the Jennings' re-issue patent. As was stated in the text, "The Federal District Court for Massachusetts holds, Nash Engineering Company v. W. D. Cashin & Co., that the Jennings' re-issue patent for a vacuum steam-heating system is valid, but not infringed by the defendant." In this connection it should be stated that W. D. Cashin & Company are the New England representatives for the Skidmore Corporation of Chicago, Ill., and that the decision of the court in reality refers to the Skidmore hydro-turbine vacuum and boiler-feed pump.

Appendix to Wisconsin Code on Heating and Ventilation

TO facilitate the of use of the Wisconsin Heating and Ventilation Code (published in THE HEATING AND VENTILATING MAGAZINE for May, June, July and August, 1925) the State Industrial Commission has added an appendix which appears in the published edition of the code. The appendix embraces extracts from General Orders on Sanitation, from the Building Code and from General Order on Existing Buildings. It is given herewith, in full:

Extract from General Order on Existing Buildings

REQUIREMENTS APPLYING TO ALL EXISTING PUBLIC BUILDINGS
THEATRES AND ASSEMBLY HALLS

Order 6216.

Fresh air shall be supplied at the rate of not less than 1,200 cu. ft. per hour per person. The fresh air shall be taken from the outside of the building and no vitiated air shall be re-heated unless it has been washed by a mechanical air washer of approved design.

MOTION PICTURE BOOTHS

Order 6224—Ventilation.

Each booth hereafter installed (except as provided below) shall be provided with a metal ventilating pipe not less than 12 in. in diameter, extending outside of the building. If a 12-in. outlet pipe is impracticable, a smaller pipe may (if approved by the Industrial Commission) be used if provided with an efficient rotary power fan.

If a standard fire window is provided not less than 4 sq. ft. in area, connecting with the outside air, and opening not less than one-half, then the ventilating pipe may be omitted. In a school, church, or lodge hall where the picture machine is operated only occasionally and for short periods of time the ventilating pipe may be omitted.

APARTMENT HOUSES, HOTELS AND PLACES OF DETENTION

Note—The following orders, relating to ventilation and sanitation, do not apply to those buildings which are already covered by the hotel regulations of the State Board of Health.

Order 6409—Size of Rooms.

Every sleeping room shall be of sufficient size to afford at least 400 cu. ft. of air space for each occupant over twelve years of age, and 200 cu. ft. for each occupant under twelve years. No greater number of occupants than the number thus established shall be permitted in any such room.

Order 6410—Windows.

No room shall be used as a sleeping or living room unless it has a window or windows opening upon a street, alley, or yard, or upon a court connecting therewith, or above the roof of an adjoining building or upon an inner court not less than 25 sq. ft. in area; or unless it has a vertically-sliding pulley-hung sash window, not less than 15 sq. ft. in area, opening into another room in the same apartment, which other room opens on a street, alley, or yard, either directly or through similar windows. Every such sash window shall be placed as nearly as possible in line with outside windows, and both halves shall be made to open readily; and the glass in the lower half shall be translucent.

Order 6411—Basement Rooms.

No basement room shall be used as a sleeping or living room unless all the following conditions are complied with:

(1) The room shall be at least 8 ft. high from floor to ceiling.

(2) The ceiling shall be at least 4 ft. above the surface of the adjoining street or ground.

(3) The room shall have a window or windows opening upon a street, alley, or yard, or upon a court connecting therewith, or upon an inner court not less than 60 sq. ft. in area; and the total window area shall be at least one-tenth of the floor area of the room, and the upper half of such window or windows shall be made to open the full width.

(4) The walls and floor shall be damp-proof and water-proof.

(5) The room shall have sufficient light and ventilation and shall be fit for human habitation.

Extract from General Orders on Sanitation

REQUIREMENTS APPLYING TO ALL PLACES OF EMPLOYMENT

Order 2000—Definitions.

"PURE, FRESH AND CLEAN AIR"
shall mean air that is both stimulating and refreshing to breathe. It shall not contain noxious gases, dust, fumes, vapor, or other materials in such quantities as to be injurious to the health. It does not necessarily mean outside atmosphere, but shall mean air that contains reasonable quantities of the vital constituents of the atmosphere.

"VENTILATING SYSTEM"
shall mean any building construction, machinery or equipment so arranged that "pure, fresh and clean air" is provided for breathing purposes.

"EXHAUST SYSTEM"
shall mean any building construction, machinery or equipment so arranged that noxious gases, dusts, fumes, vapor or other materials injurious to the health are removed from, or prevented from contaminating the air any employee must breathe.

Order 2010—Purity of Air.

The air, which any employee must breathe, shall be pure, fresh and clean.

Order 2011—Minimum Cubic Feet of Air Space.

The employer shall furnish every employee at least 400 cu. ft. of air space. In computing the available cubic feet of air space the height of the room shall be taken at not to exceed 11 ft. and the space occupied by equipment and material must be subtracted.

Order 2012—Temperature and Humidity of Air.

Every employer shall furnish air temperature and humidities that do not produce extreme or unreasonable conditions, considering the nature of the industry.

Note—The most desirable relative humidities and temperatures for workrooms are respectively 50% to 65%, and 60° to 68° F. The nature of the work done, the moisture and dryness of the body's surface, the kind of clothing worn, the motion of the air, its temperature and humidity, and the kind of materials used in the process are all factors which will cause a variation in temperature and humidity.

Order 2020—Ventilating Systems.

Ventilating systems shall be provided for at all places of employment where smoke, gas, dust, fumes, vapor, foul air, vitiated air, or industrial poisons are used, stored, handled, or are present in the air in sufficient quantities to obstruct the vision, or to be irritating, or to be injurious to health, and when there is available less than 1,000 cu. ft. of air space per person. Ventilating systems must replace the air twice each hour and supply an additional amount of air to make up for losses or contamination of air or oxygen due to the nature of the work being carried on. All ventilating systems shall furnish as a minimum requirement 1,800 cu. ft. of pure, fresh and clean air per person each hour.

Order 2021—Exhaust Systems. When Required.

Exhaust systems shall be provided for all machines, vats, tanks, furnaces, forges, salamanders, and all equipment and processes which create and throw off dust sufficiently light to float in the air or which emit fumes, gas or smoke in such quantities as to be irritating, or injurious to the health, unless the general ventilating system keeps the air which any employee must breathe pure, fresh and clean.

Order 2022—Positive Inlets and Outlets.

All ventilating and exhaust systems shall be provided with positive inlets and outlets. Doors, windows, cracks, or elevator shafts are not positive inlets and will be accepted as positive outlets only when the ventilating system forces outside air into the building.

Note—If the building construction is such that mechanically operated sash of proper construction can be used to advantage, they will be accepted as positive inlets and outlets.

Order 2023—Dust Collectors and Air Washers.

All exhaust systems must be provided with a dust collector, air washer or some machine, contrivance or method which will prevent the discharge from contaminating the air in or around the place of employment.

Order 2024—Drafts.

All ventilating or exhaust systems must be so designed, constructed and operated that there will be no drafts, changes in temperature or backdrafts, which are injurious to health. Where workmen are exposed to drafts or changes in temperature injurious to health, from the opening of doors or windows, suitable protection shall be provided.

Order 2025—Ventilation in Drying Processes.

Conditioning drying or heating processes shall be carried on in rooms so equipped that there is sufficient motion of the air to prevent the formation and accumulation of poisonous or explosive gases, stagnant or dead air.

Order 2207—Existing Toilet Rooms—Ventilation.

Every toilet room heretofore installed, which is not adequately ventilated by outside windows or skylight, shall be provided with a vent flue of size specified in order 5254, in which a fan shall be placed, if necessary, for proper ventilation.

Every such toilet room which cannot be kept sanitary shall be moved so as to be open to outside light and air.

Order 2300—Laundry Requirements—Heat Deflectors.

On all roll body ironers, the hot roll must be equipped with a heat deflector which must be lined with a non-conductive material. The deflector must extend far enough down in front to deflect the heat and prevent it from being thrown out toward the operator. On all shoe body ironers, the shoe must be covered with non-conductive material.

Note—All machines throwing off heat should be so placed and equipped that the heat from one machine is not thrown on the operator of another machine.

Order 2301—Rooms Provided with Exhaust Systems.

Wherever flat work ironers are operated, the room must be provided with an exhaust fan of sufficient capacity to draw out the excessive heat or steam which arises.

Note—Ample positive ventilation should be maintained throughout the laundry, particularly the rooms in which washing, ironing, or any other heat or humid process, is carried on.

Abundant fresh tempered air mechanically supplied at or near the floor line, and in conjunction with ample natural ceiling outlets or exhaust fans, constitutes the most generally applicable and satisfactory ventilation for laundries. Outside air should be used, but it generally need not be made more than comfortably warm. Proper distribution is very important.

Extract from Building Code

REQUIREMENTS APPLYING TO NEW INSTALLATIONS IN PUBLIC BUILDINGS AND PLACES OF EMPLOYMENT

Order 5203—Windows.

Every room in which one or more persons live, sleep, or are employed (except storage rooms or other rooms where the nature of the occupancy will not permit), shall be lighted by a window or windows opening directly upon street or alley or upon a court on the same lot with the building. The windows shall be so constructed and distributed as to afford proper light and ventilation. Every building more than 40 ft. deep (measuring at right angles to the windows) shall have windows on at least two sides.

Note—For toilet room windows, see Order 5253.

Order 5206—Ventilation of Courts.

At the bottom of every shaft or inner court there shall be sufficient access to such shaft or court to enable it to be properly cleaned out. Every inner court which is required under Order 5203 and which is more than one story in height shall have an intake for fresh air, leading from the street or other open space. The area of such intake in square feet shall equal at least two one thousandths of the number of cubic feet contained in said court; but such area need not be more than 50 sq. ft. Every intake shall be constructed of fireproof material, and unless said intake is used as a passageway for persons there shall be no openings into the same other than the inlet and outlet.

Order 5215—Hot Air Pipes.

Every hot air pipe contained in or passing through a combustible partition or floor shall be placed inside another pipe arranged to maintain a ¼ in. air space between the two pipes on all sides; or the pipe shall be securely covered with ¼-in corrugated asbestos. The bend at the bottom of the vertical pipe shall be kept at least 2 in. from any woodwork.

Note—Where a hot air pipe is placed in a 4-in. partition, metal lath over the pipe is recommended.

Order 5216—Registers.

All register boxes shall be of metal, and shall either be double or be covered with asbestos not less than ⅛ in. thick.

Order 5217—Hot Air and Ventilating Flues.

Every vertical hot air and fresh air flue or group of flues in the school, theatre and hotel groups (see Order 5008) shall be enclosed with, or constructed of, incombustible material at least 2 in. thick, lined with metal or smoothly finished on the inside; except that frame buildings not more than two stories in height may have metal flues if protected as in Order 5215. Horizontal ducts for hot air and fresh air, and all vent flues shall be constructed as in Order 5215, or better.

REQUIREMENTS APPLYING TO NEW APARTMENT HOUSES, HOTELS AND PLACES OF EMPLOYMENT

Order 5717—Size of Rooms.

Every sleeping room shall be of sufficient size to afford at least 400 cu. ft. of air space for each occupant over twelve years of age, and 200 cu. ft. of air for each occupant under twelve years. No greater number of occupants than the number thus established shall be permitted in any such room.

Order 5718—Basement Rooms.

Every basement, living or sleeping room shall be at least 8 ft. high from floor to ceiling. The ceiling shall be at least 4 ft. above the outside grade. The walls and floor shall be damp-proof and waterproof.

No rooms wherein persons are forcibly confined shall be located in a basement.

Order 5719—Windows.

The outside windows in every sleeping or living room shall have a total area of at least one-tenth of the floor area of the room, but not less than 12 sq. ft. The top of at least one such window shall be not less than 6½ ft. above the floor, and the upper half of it shall be made so as to open the full width.

T. E. B. SIMPLIFIED ACCOUNTING SYSTEM for heating contractors or master plumbers is the subject of a pamphlet just received from the National Trade Extension Bureau, describing and illustrating the principal forms used with this system. In each case the forms contain typical entries, showing their practical application. Full instructions, the bureau states, accompany each sheet. Those illustrated include a job record sheet, workman's order, cash, purchase and general journal, sales journal, pay roll form and form for workman's daily report. Size 8½ x 11½ in. Pp. 8.

Clock Thermostats and Oil Burners

By H. W. Sweatt

THE statement has been made and has been accepted by many engineers that a clock thermostat which automatically lowers the temperature during the night, with the automatic return to the daytime temperature in the morning, does not save fuel when used with an oil burner. The argument is that the saving of fuel with a clock thermostat is confined to a coal-fired installation.

Much is made of the point that while the clock thermostat lowers the indicator at night, the water in a steam or water heating system cools down to such a point that it requires the burning of more oil to raise the water temperature and, consequently, the house temperature, than it would to maintain the temperature during the night at 70°.

The foregoing argument, however, is based upon the assumption that when the indicator is lowered, the oil burner is shut off all night. If this were true, the argument might be sound, but experience teaches that a burner always operates during the night in direct proportion to the heat losses in the home and the outside weather conditions. Also, statistics of the weather bureau show that night temperatures average very close to 15° lower than daytime temperatures, hence if it requires a given amount of oil to raise the daytime temperature in the house to 70°, it will require more oil to maintain the night temperature at 70°, due to the lower outside temperature.

It is very difficult on oil-burner installations to get accurate oil consumption and, therefore, an accurate basis of comparison. For this reason, to settle the question, it is necessary to turn to another and similar field for accurate statistics and proof.

Reliable records of actual fuel consumed over a period of years, together with other valuable data, are found in the field of gas heating. As heating with gas is identical with oil, due to the fact that both usually employ intermittent firing periods, facts that are true with gas heating are equally applicable to oil. In the gas field it has been definitely proven that clock thermostats do save fuel and there are reliable and accurate statistics to prove the fact.

In THE HEATING AND VENTILATING MAGAZINE for July, 1925, in an article by Glenn C. Carnahan, superintendent of the House Heating Department of the People's Gas Light and Coke Company, of Chicago, entitled, "What it Costs to Heat with Manufactured Gas," Mr. Carnahan states:

"A home usually retains enough heat to be comfortable when the outside temperature averages 60° F. for the day. Artificial heat is needed only when the daily average drops below 60° F. From the report of the United States Weather Bureau, we find that the daily average temperature for Chicago is below 60° F. normally between October 7 and May 18, and the normal or average heating season for Chicago is, therefore, a period of 225 days. We also find from these reports that the average temperature for this period is 38.9° F.

"We assume that the average home will be kept at 70° for 16 hours of the day and at 55° for 8 hours of the day. We find that the number of hours the homes are kept at 70° is 224 x 16 or 3,584 hours and at 55° the number is 224 x 8 or 1,792 hours during the heating season.

"Since the amount of heat required is proportionate to the temperature difference between the inside and the outside of the home, as well as to the length of time the heat is required, we estimate the amount of heat required by means of degree-hours. Degree-hours is the product of the difference between the inside and outside temperatures of the home in degree Fahrenheit, times the number of hours heat is required.

"The difference between an inside temperature of 70° and the average outside temperature of 38.9° for the heating season is 31.1°. This average temperature difference is maintained for 16 hours of the day. The average night temperature difference between 55° and 38.9° is 16.1°, which is maintained for 8 hours during the night. The total degree-hours for Chicago will then be 3,584 x 31.1, equalling 111,462.4 plus 1,792 x 16.1, equalling 28,851.2, which is 140,313.6 degree-hours.

"This figure of 140,313.6 degree-hours, if multiplied by the hourly B.T.U. loss of a building per degree difference between inside and outside temperatures, will equal the total heat loss per season, that must be replaced by artificial means in climatic conditions equal to Chicago.

"Since it is customary in many cases to calculate the hourly B.T.U. loss from a building on a basis of 70° F. difference between the inside and outside temperature, then by dividing 140,313.6 by 70, gives us a figure of 2,004, which multiplied by the hourly heat loss, calculated on the basis of a 70° difference, also equals the total heat loss per season. If the B.T.U. loss is figured on 70° inside and minus 10° outside then the figure of 140,313.6 will be divided by 80 which will give the multiplier of 1,754 which should be used when figures on radiation are based on minus 10° outside temperatures.

"Similar constants can be worked out for any climatic condition other than those corresponding to Chicago by use of the U. S. Weather Bureau reports.

"The cubic feet of gas required per season will be yearly B.T.U. loss ÷ B.T.U. per cubic feet × efficiency of heating plant, equals the cubic feet of gas consumed per season.

"The cost of gas per season in dollars will equal the cubic feet of gas required per season times the price of gas in dollars per cubic foot."

It will be noted in the above that exactly the same formula can be applied to oil heating, simply substituting the B.T.U. figure of oil for that of gas.

Analyzing Mr. Carnahan's figures above we find that in the city of Chicago, by reducing to degree-hours, if the temperature is steadily maintained at 70° 24 hours during the day, we must heat 167,193.6 degree-hours; while by lowering the temperature during eight hours of the night to 55° we need only 140,313.6 degree-hours, a saving of 26,880 degree-hours, or 16%. In other temperature zones where the average outside temperature is lower or higher than 38.9°, the savings by clock control will be in direct ratio.

IS THIS THEORY PRACTICAL?

Many theories when reduced to practice are not accurate, due to unforeseen and unexpected factors. The above method of computation, however, has been proved out in actual practice. The People's Gas Light and Coke Company of Chicago use this formula in a monthly checking of actual consumption against estimates. Mr. Carnahan says:

"This can be done with a high degree of accuracy except for the fall and spring months, when, due to wide variation of heat requirements and ventilation, considerable latitude must be allowed. This method is quite accurate for cold weather in spire of the fact that no correction is made for the effects of sunshine and wind velocity or direction.

"The daily figures are kept up to date and each sales engineer keeps them in a note book. Bills then can be discussed intelligently and customers in general seem to understand and believe in the explanation.

"All bills for gas used in central heating plants are checked by this method before they go to the customers. If the check shows that the costs are running much in excess of estimates a thorough investigation of the equipment, and the habits of the users are made.

"The one most common cause for increased consumption of fuel is due to the fact that since the average outside temperature for the heating season in Chicago is 31.1° F., then each degree above 70° maintained in the home increases the fuel consumption 3.2%. Such facts when high temperatures are found are explained, and the customer uses his own judgment."

THEORY APPLIED TO WATER HEATING

If the arguments against clock con-

trol were sound the worst showing would be made on hot water systems. In Mr. Carnahan's article he lists 37 typical hot water jobs running from a frame bungalow exposed, five rooms, with 400 sq. ft. of water radiation, to a three-story brick and frame, well exposed, 23-room residence, with 2515 sq. ft. of water radiation.

A comment made by THE HEATING AND VENTILATING MAGAZINE establishes beyond question, first, the general all-around accuracy of this method of determining fuel consumption and secondly, establishes it as applied to hot water heat. This comment is:

"A most interesting coincidence has developed as the result of analyzing the figures presented by Mr. Carnahan exemplifying the cost of gas heating in Chicago. If we add together all of the gas consumed on all the hot water jobs for the entire season and divide by the total rated load, we find that it required 706.8 cu. ft. of gas per square foot of radiation for the season of 1924-1925.

"If now, we take the curve developed by the American Gas Association and shown in connection with an article entitled "Practical Notes on House-Heating by Gas," in THE HEATING AND VENTILATING MAGAZINE for December, 1924, we find from this curve that the cubic feet of gas per square foot of installed water radiator per degree-day is 0.115. If this is multiplied by 6150, the number of degree-days in the Chicago territory for the heating season of 1924-1925, we find that theoretically there would be required 706.9 cu. ft. of gas for the season. Such remarkable checking is, of course, a coincidence and could not be expected as the usual thing. However, it clearly exemplifies the value of the data developed by the American Gas Association, and the accuracy with which gas consumption in any part of the country may be predetermined."

Tight Longitudinal Joints for Split-Tile Pipe Conduits

The endless problem of fuel saving by no means stops with the steam-generating plant. Efficient as the boiler equipment may be, it is obvious that its economies are futile if the steam is not delivered to its point of use with the lowest possible distribution losses.

There are four requirements of the utmost importance in the design of insulation and protection for underground steam lines.

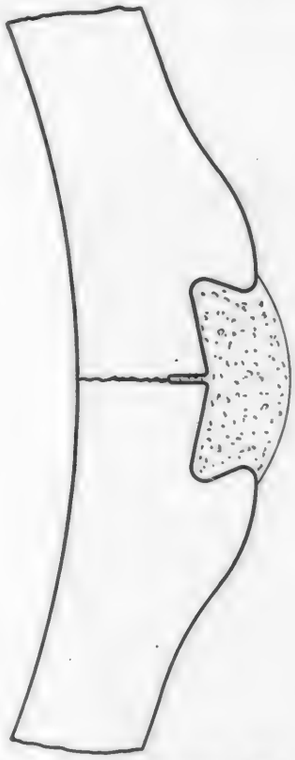
(a) Covering material must be a good heat insulator.

(b) Protective covering must be waterproof.

(c) The entire insulation must be constructed of materials that do not deteriorate in the ground either due to heat from the steam lines or from any moisture that may be present.

(d) The insulation must be of a character such that if it gets wet it will dry out without damage to its insulating properties.

In an extensive street installation in a large city such as Cleveland perhaps the most important item mentioned above is the second. Water lines have many leaks, and unless these leaks are large, they go unnoticed and sometimes



Construction of Split-Tile Pipe With Special Fins on Side for Sealing With Concrete

continue for years. Under-draining the steam lines will help this situation materially, but still it is of the greatest importance that the protective covering around the insulation be waterproof.

The principal objection to split-tile or channel-pipe construction has been the trouble in making tight, longitudinal joints. A thin, cement grout has been applied to the rough edges, but has not always proved satisfactory, as it is almost impossible to keep some dirt off these edges, particularly on a windy day. Also this grouting necessitates having a fine screened sand and a special mix of cement on the job. Furthermore this cementing must be done as the top half of the channel pipe is placed which is inconvenient and at time not possible.

To overcome this situation a channel pipe with special fins or lips on the sides, shown in the accompanying illustration, is now being successfully used. The space between these fins is filled with ordinary concrete, thus sealing the joint, and on account of the special construction of these fins, tying the two halves together permanently in all directions and making an exceptionally strong joint which is visible and readily inspected. This concreting may be done any time it is convenient after the tops are placed. Repeated tests made by filling a ditch one foot over the top of this type of construction and then puddling same have shown on digging up again that this joint is absolutely watertight.

The standard construction in Cleveland is to install this special tile or conduit on top of a special drain tile which serves also as a support for the conduit.—CHARLES H. DAY, *Superintendent of Heating, Cleveland (O.) Electric Illuminating Company.*

Researches in Mine Ventilation

A symposium on underground ventilation is being undertaken by the Mine Ventilation Committee of the American Institute of Mining and Metallurgical Engineers. In a letter sent out recently by this committee, a list of suggested subjects is included for the use of the various sub-committees, with the hope that each sub-committee will prepare a paper on the subject assigned to it for presentation at the next annual meeting of the Institute.

Under coal mine ventilation, the subjects listed include exhaust versus pressure regulation, limitations of exhaust method of ventilation in gaseous mines, limitations in splitting the ventilating current from the standpoint of decreasing the velocity to an undesirable point, location of main fans on the surface, location and general type of booster and of auxiliary fans and method of driving, and whether reversing of the air current should be provided for. Separate lists are made up for metal mine ventilation, and other lists relate to physiological studies of air, fans, and physics of ventilation.

Closer Contact Proposed Between Trade and Engineering Associations

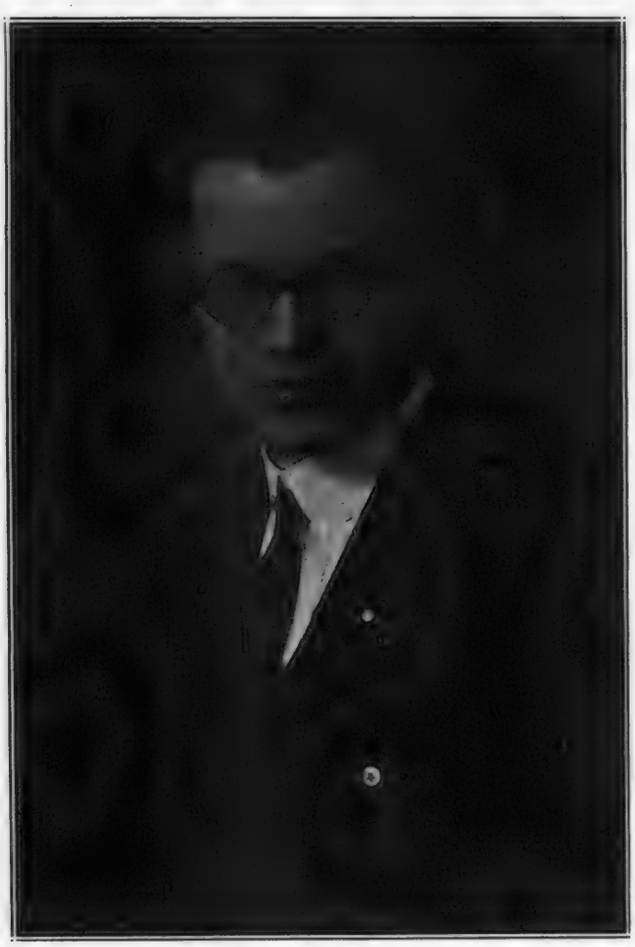
The Washington convention provided for the establishing of a point of contact between several other associations allied with the building industry and ours by the appointment of a representative to work with representatives of these, discuss matters of mutual interest and recommend whatever action may be necessary.

Representatives were appointed to the American Institute of Architects, American Zinc Institute, National Slate Association, Sheet Metal Branch of the National Hardware Association, National Warm Air Heating & Ventilating Association, American Society of Heating and Ventilating Engineers. None of these appointed representatives to our association.—*National Secretary, Edwin L. Seabrook, before the National Association of Sheet-Metal Contractors.*

American Society of Heating and Ventilating Engineers

The New Director of the Research Laboratory

The appointment is announced of Secretary F. C. Houghten, of the American Society of Heating and Ventilating Engineers, as director of the A. S. H. & V. E. Research Laboratory in Pittsburgh. Mr. Houghten has already gone to Pittsburgh where he will maintain his headquarters. He thus returns to the scene of his former work where, as first assistant to Dean Anderson, he conducted important investigations, from 1920 to 1923, of a number of problems of heating and ventilation.



F. C. Houghten
The New Director of the A. S. H. & V. E. Research Laboratory

Mr. Houghten first became associated with the A. S. H. & V. E. Research Laboratory through his research work while with the Bureau of Mines. During the war period he was in charge of the Bureau's Physical Laboratory as physicist. Later he had charge of investigations of transmission of heat through boiler tubes and of an investigation conducted by the Bureau of Mines of heating and cooking devices used in the army. He also had charge of research work on combustion and heat transmission in large, low-pressure heating boilers.

His association with the A. S. H. & V. E. Research Laboratory dates from 1920, when he was employed by the late Director John R. Allen. Some of his more important work under Dean Allen was in connection with heat transmission through building materials, cooperating in this work with the Pennsylvania State College. Other problems in his investigations included the flow of steam in pipes, ozone and air-conditioning, and the effect of temperature, humidity and air motion on human beings. Mr. Houghten has been secretary of the society since 1923.

In an announcement of Mr. Houghten's appointment, issued by the Committee on Research, of which William H. Driscoll is chairman, the committee goes on to state that "after many months of thought and effort on the part of your committee, after consideration of the names of many individuals as prospective directors for our Research Laboratory, after special committees had labored over the problem and when despair of ever reaching a satisfactory conclusion had come over the committee, we have found in our own family circle the man who, we are satisfied, understands the problems of the directorship, has the capacity and the ability to handle them and has that intense interest in the Laboratory and its work which is so essential to the successful handling of its problems."

"Ferry C. Houghten," continues the committee's statement, "now serving the society most excellently as secretary, has loomed up as the outstanding candidate for the position. Mr. Houghten kept as far in the background as possible while the committee struggled with the problem, feeling that it would be quite improper for him to make the slightest effort to gain the appointment while serving the society as its secretary."

"Mr. Houghten," adds the statement, "is essentially a worker—the kind who is so intent on doing the job in hand that he makes the impression through the work that he does, rather than by the personal enthusiasm that he creates. He is of the Coolidge type—calm, cautious and confident, the kind of a man who is apt to be overlooked, but when discovered, produces results that far exceed all expectations."

Announcement of the program to be put into effect at the Research Laboratory, it is stated, will be made to the society at the earliest possible moment.

Bringing the Convention Back to the Home Office

An effective way of giving those who could not attend their trade convention the benefit of the proceedings has been carried out by Davis S. Boyden, of the Edison Electric Illuminating Company of Boston. Immediately upon Mr. Boyden's return from the convention of the National District Heating Association, in West Baden, Ind., last June, he arranged to reproduce the convention on a small scale for the benefit of the entire heating department of the company. A program was arranged to occupy a whole day and sessions were held in the library of one of the company's service buildings.

All of the important papers and reports were presented, either in full or in abstract, different officials of the department being assigned the subjects in their respective fields. Mr. Boyden presided. Due to the fact that he had been present at the main convention, he was able to give the smaller gathering much of the "color" and enthusiasm of the original meeting.

Correspondence

Use of Central Vent Flues In Corridors

EDITOR HEATING AND VENTILATING MAGAZINE:

Is it permissible in New York State in public school building work to eliminate individual vent flues in classrooms and exhaust the air through grilles in the doors to the corridors and thence through a single large flue?

New York. O. W. E.

No, it is not. In a ruling on this point, received from Frank H. Wood, director of the School Buildings and Grounds Division of the State Department of Education, Mr. Wood states:

"Under our building code it is not permissible to install a central vent flue in a corridor with grills in the classroom doors, instead of separate vents from each classroom."

Sluggish Circulation of Water Due to Slight Motive Head

EDITOR HEATING AND VENTILATING MAGAZINE:

I am enclosing a sketch of a garage water heating system. This system is under 80 lbs. pressure and is fed from a ½-in. city water pipe direct into the return at the jacket heater. The total length of the piping distance from the jacket heater to the wall radiator is 80 ft. The top of the radiator is almost level with an air vent tee on the feed line above the jacket heater. Will you kindly give me the reason why this system circulates so slowly?

Hamilton, Ont. H. R. F.

Water circulates in the system in question, not because of the city water pressure referred to, but because of the difference in weight of two columns of water, one of which is in the return from the radiator and therefore colder and heavier than the other which is in the vertical flow pipe from the heater.

Suppose we have two columns of water at 180° F. temperature, each in a pipe of equal size about 10 ft. high. With one of the columns cooled to 140° we would find that the latter column would contract perceptibly, enough so that the water column would lower about 1½ in. The two columns, though unequal in height, are equal in weight and would balance one another, but if enough water were added to make up the difference in height between the two columns, the column of water at 140° would be heavier than the one at 180°. This would cause the water to lower in the return pipe, thus forcing the hotter and lighter water* up in the flow pipe. In other words, the space in the flow pipe contains less weight of water at 180° than an equal space contains at 140° in the return pipe. If the water in the flow pipe was not continually being heated by the heater, the two columns of water would soon equalize in temperature and cease to circulate.

Anything that will increase the difference in weight between the two columns of water will increase the circulation and this may be done either by having colder water in the return pipe or by increasing the height of the two columns. For example, if the flow pipe were carried up to the roof of the house and then down to the point where it leaves for the garage the cooling effect of the long pipe going down would help the circulation to a great extent, particularly if the down pipe were left uncovered. The effect can be even further increased by discharging the cold return water from a radiator on the top floor into the down pipe.

As the installation is now made, water in the slight drop of pipe at "A" is cooler than that in the vertical flow pipe at the heater, hence it lowers, while water in the return pipe from the radiator is still colder and heavier than that in pipe "A". Likewise it, in turn, lowers and forces the hotter water around the circuit. The small difference in height is what causes the slow circulation, particularly when starting up, at which time the water is at an even temperature throughout the system. For this reason a starting pipe as shown dotted at "B" could be used to assist in establishing an initial circulation between flow and return headers before the water in the mains is moving; in fact, such a pipe is occasionally used in gravity water heating systems even

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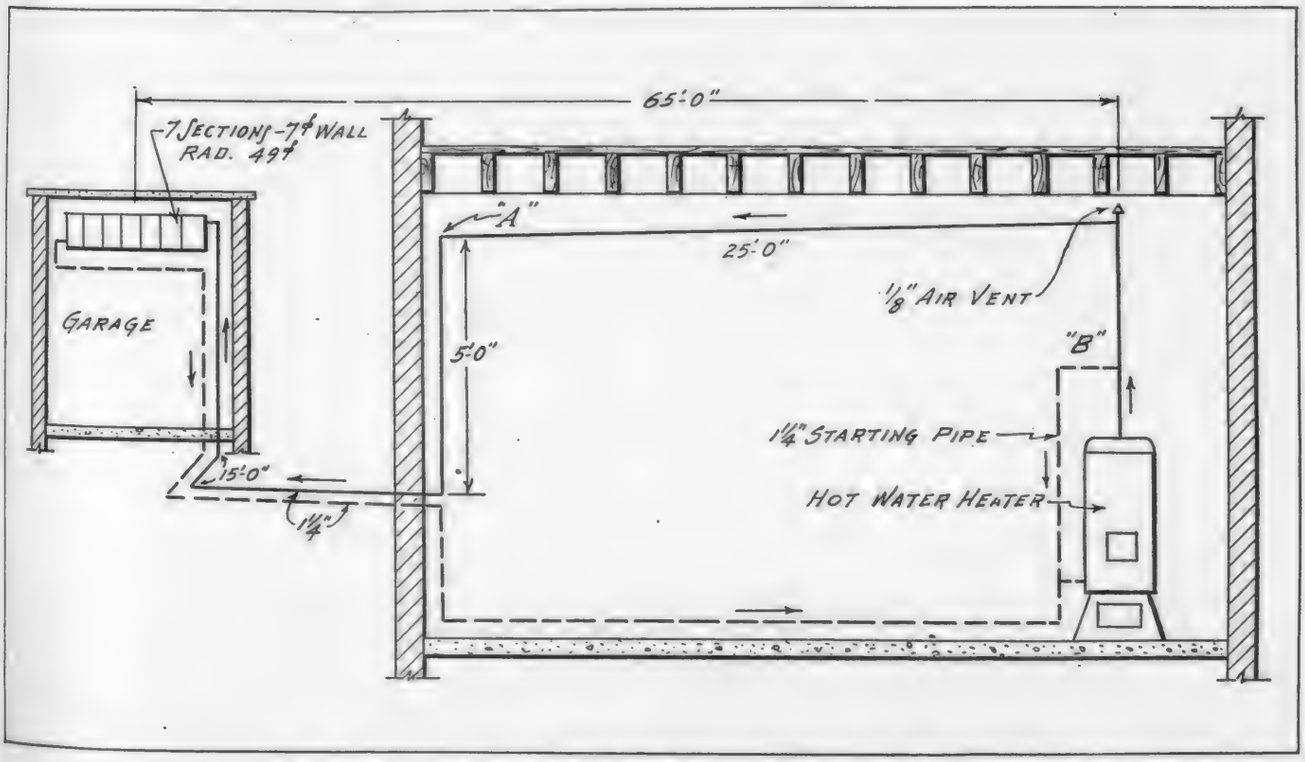
* We are accustomed to say that hot water rises when in reality it is forced up by the cold water lowering due to its greater weight.



Garage Water-Heating Plant Which Gave Trouble Due to Sluggish Circulation

where the system is quite the usual and contains no difficulties such as those cited. Connect this pipe well up on the flow pipe so as to obtain maximum circulation.

It would have been better had the flow pipe been pitched up to point "A" and the air vent installed at this point to vent the pipe before it dropped. However, if this is not a closed system the air should be vented by extending the flow pipe directly up to the expansion tank. The drop pipe at "A", as well as the vertical return pipe should not be covered. Of course, all pipes should be of ample size and have proper pitch in the right direction.

Solving such problems as these is not difficult if the principle of circulation is kept in mind and care is taken to vent the piping properly. This kind of problem, with all variations, was recently detailed at length, with illustrations, in THE HEATING AND VENTILATING MAGAZINE for November, 1924 and January and April, 1925.

Size of Boiler and Pipe Coil Required for Heating Water

EDITOR HEATING AND VENTILATING MAGAZINE:

Will you kindly give us the size of boiler necessary to heat a 315-gal. open tank, filled with water, from 60° to 212°, in one hour, with steam at 5 lbs. pressure, the heater to be equipped with a coil?

New York. A. R. B.

It would be necessary to know the particular make of boiler in mind before the proper size of boiler could be determined, as present-day boiler ratings are a problem in themselves. However, the load in equivalent direct cast-iron column radiation may easily be determined as follows:

Gallons of water × weight in pounds × temperature rise, divided by 250 B.T.U., the transmission per square foot of direct cast-iron radiating surface, or $315 \times 8.33 \times (212° - 60°) \div 250 =$ 1595 sq. ft. of radiating surface.

The square feet of coil surface required would be figured as follows:

Divide the heat units required to heat the water as figured above by the product of the transmission per square foot of coil surface times the difference in temperature between that of the steam and the average or mean temperature of the water, thus:

$$\frac{1595 \times 250}{130 \times \left(227° - \frac{212° - 60°}{2}\right)} = 34 \text{ sq. ft.}$$

of coil surface.

The transmission of 130 B.T.U. per square foot of coil surface is for iron pipe placed horizontally in the water. The transmission for brass or copper coils would be 190 B.T.U. making 23 sq. ft. of coil surface required, or if the pipes were placed vertically in the tank, these transmission factors would become 170 and 230 B.T.U., respectively, and the coil surface required, 26 and 19 sq. ft., in the same order. The lineal feet of coil, if of 1½-in. pipe, would be twice that of the above figures.

Tests would show these factors to be somewhat higher, but the above figures are conservative, making allowance for fouling of the pipes and the low velocity of water that would obtain in an open tank, in fact it would be much wiser to increase these amounts somewhat as it is doubtful whether the water can be readily heated to a final temperature so near that of the steam. Some allowance should also be made for the heat loss from the open tank.

Second Printing of "House Heating With Oil Fuel"

When the second edition of "House Heating With Oil Fuel" was prepared, only four months ago, it was hoped that it would meet a demand at least as great as had its predecessor, in view of the addition of much new and valuable matter. Twice as many copies were printed, but in less than four months the entire printing has been exhausted, and several hundred orders have accumulated. A second printing is now ready for distribution. Certain revisions have been made, notably to bring the regulations of the National Fire Prevention Association in line with the recent accepted formulation, and to add to the list of approved domestic burners those "listed" by the Underwriters since the first printing.

Many gratifying letters and verbal expressions have been received in regard to this publication from those prominently identified with the oil burner industry, including C. H. Chalmers, president of the American Oil Burner Association, and executives of many oil-burner manufacturing concerns. The book has been purchased in quantities by several manufacturers for use by their agents, and in more than one instance it has been so used by a manufacturer whose product was neither pictured nor described in it. One manufacturer used the book as a sales argument, inviting the prospect to use it as an unbiased source of information, and then form his own opinion of the merits of the burner.

An interesting slant has been afforded by the fact that several hundred copies have been individually sold to coal dealers, or those in the coal industry, and in one case three successive orders for a quantity of the books were received from one coal company. One letter from the "———— Coal Company, Coal and Coke, Wholesale and Retail," ordering two copies concluded with: "We're in the fuel-oil game."

As a possible reflex of this publication, the author, P. E. Fansler, associate editor of THE HEATING AND VENTILATING MAGAZINE was asked to prepare an article on residential oil burning for *Good Housekeeping Magazine*, with its circulation approaching two million, and this developed into two display stories, one of which appeared in the September issue, and the other will follow in October. Mr. Fansler has also prepared for the *Good Housekeeping* Institute a bulletin on the same subject.

From the above, and taking into account the fact that every issue of the magazine includes one or more articles having to do with the subject of domestic oil burners, it will be apparent that HEATING AND VENTILATING MAGAZINE is cognizant of the potentiality of this infant industry, and is appreciative of its position as a factor in the heating field.

Large Oil Storage Tanks Are Being Jacketed

One of the large oil companies has adopted a unique scheme of cutting costs by covering the sides of its steel storage tanks with a felt jacket. Vertical battens are placed around the tank, running felt jackets to the battens in horizontal strips extending around the tanks, each being lapped slightly over the one below. Experiments made last winter determined the value of jacketing the tanks as it was found that the heat could be maintained in the tanks over a much longer period than when unprotected. Inasmuch as heavy oils are stored, whose handling is impaired by cold weather, this jacketing represents real saving. In winter weather in Ohio water could be settled out of the protected tanks, but those not covered would require heat. This time of the year the temperature of the oil, when it comes from the ground, is high enough to do away with heat if it is admitted immediately in a jacketed tank, otherwise it must be heated to settle out the water and handle it.

Movie House Locates Heating Boilers on Roof

Novel practices in heating and ventilating design have been adopted in the Capitol Theatre of London, generally regarded as the most luxurious and perfectly-equipped motion picture house in Europe. The entire system is fired by city gas in a tubular gas boiler. By using gas the theatre has also aided the "brighter London" movement to eliminate the smoke nuisance.

One of the most interesting features of the installation is the fact that the gas boilers are placed on the roof where they are entirely out of the way. As the result the basement and part of the first floor are made available for other and more remunerative purposes, as well as the space ordinarily required for coal and ashes.

Seattle's Electric Heating Era

A RATE for electricity in Seattle, Wash., of 1 cent per kilowatt-hour, recently put into effect, marks the beginning of a great era of electric heating, according to the 1924 report, just received, of the Seattle (Wash.) Department of Lighting, J. D. Ross, superintendent. According to the Department, there are now about 200 houses electrically heated in Seattle, 150 of which have been connected in the "last ninety days." One firm alone has commenced building 300 electrically heated homes.

There is about 4000 K.W. used in the 200 homes and another 2000 K.W. in reflecting heaters scattered throughout the city. There are about 1000 water heaters using, in summer, about 3000 K.W. About 30 K.W. per day is now being connected for water heaters alone. The Department is encouraging the use of water heaters, but though very desirous of the load, is leaving the decision on the use of electric heat to the customer, believing that unless there is current available for all, it is impossible to guarantee perpetual service. In the meantime, the heating load is doubling every few months and, the report states, could easily be increased to enormous proportions so fast that it could not possibly be cared for with the present plant.

The Department's view of the matter is that if the city's vision could be turned to the development of large power units in time for the demand, the city could have electric heating for many years to come. The antagonism of the power companies, it is claimed, who themselves will not develop power unless immediate dividends are in sight, are largely responsible for the delay in financing Seattle's municipal system.

As an example of what could be done, the Department cites the Federal report on the Umatilla project, with its capacity of 420,000 H.P. and its estimated cost of electricity at the point of production of 1.2 mills per kilowatt on 100% load factor, or $10.51 K.W. per year, which is equal to 2 mills on a 60% load factor. The load factor of heating installations, it is pointed out, would not average much above 25%, while the portion used for irrigation and other farm uses would average 40%. The addition of metallurgical and other farm uses would increase the load factor so that it could easily be raised to 60%.

Seattle, according to the Department of Lighting, could easily use 200,000 H.P. for heating, which would heat about one-tenth of the present city. The Department's report goes into the possibilities in detail and concludes with the statement that "the delivery of current within the city of Seattle at 7.5 mills for heating is easily possible, and there need be no extra charge for this to the customer. His contract would call for a flat charge of $15.67 per kilowatt year, plus the kilowatt-hours used at 7.5 mills above the 25% load factor. The market for this power at this rate is practically unlimited. The rising price of fuel and low cost of operation make electric heating more eagerly sought each year."

Steam Wastes in Heating Systems

While it is possible, of course, to waste unlimited quantities of steam in a heating system, figures obtained from actual installations designed to operate with reasonable efficiency have shown in some cases a consumption of up to 1000 lbs. per season per square foot of radiation. When it is considered that this figure may be readily brought down to one-half that amount, or 500 lbs. and give all of the heating effect required, the importance of some automatic heat control is appreciated.

As a matter of fact, a square foot of direct radiation should and normally will, without waste, condense 400 lbs. of steam per season. Many radiators are doing better than this where buildings are well constructed and where the night temperatures are maintained at a fairly low point. In a well-constructed building it is possible to maintain considerably lower night temperatures than in a poorly-constructed building. The "heat capacity" of the walls tells us how far we may lower the night temperature to get the greatest economy.

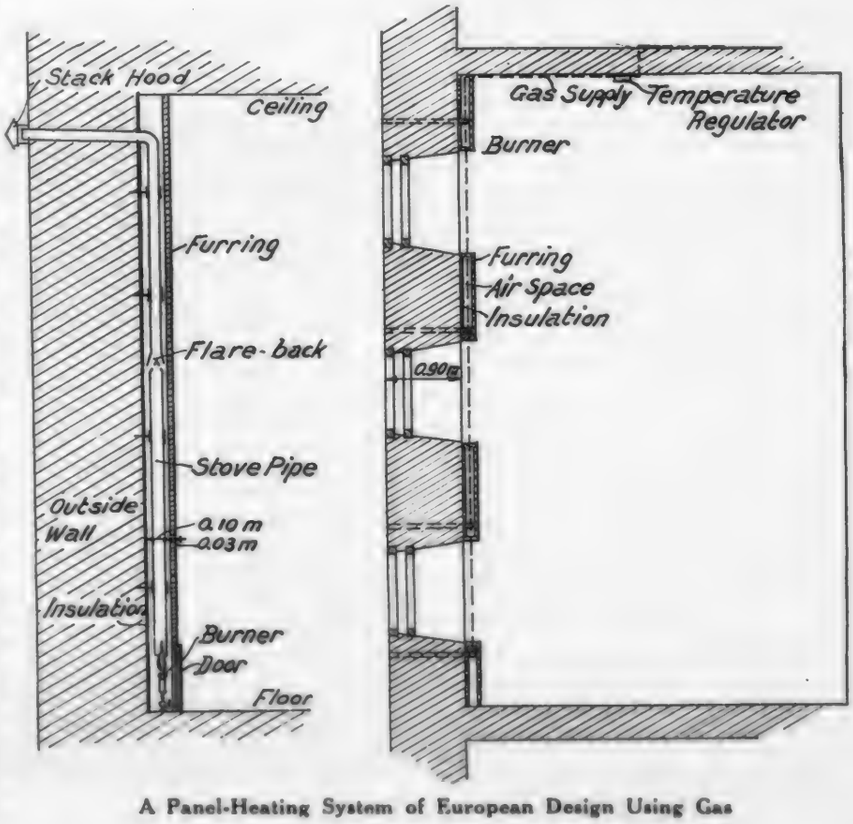
No manual control can possibly be on the job so continuously as to shut off the steam at exactly the right time and turn it on again in the same manner. If it could the cost would be too high.

Gas Industry Provides for Possible Coal Shortage

"The gas industry may have its deficiencies, but no one can accuse it of not taking steps to safeguard its customers in the domestic, the house heating and the industrial fields against any fuel want in case a strike occurs and a coal shortage results," Floyd Parsons recently told a gathering of gas salesmen and engineers. "If I were selling gas to industrial users, or it devolved upon me to plead the case of the gas industry before any important public commission, I would be sure to include as one strong argument the statistical record of the industry's coal purchases prior to the happening of each coal mining emergency."

European Design for Panel Heating with Gas

A scheme of panel heating with gas is reported by a writer in *Gesundheits Ingenieur* and is shown in the accompany-



A Panel-Heating System of European Design Using Gas

Clock Thermostats and Oil Burners

By H. W. Sweatt

THE statement has been made and has been accepted by many engineers that a clock thermostat which automatically lowers the temperature during the night, with the automatic return to the daytime temperature in the morning, does not save fuel when used with an oil burner. The argument is that the saving of fuel with a clock thermostat is confined to a coal-fired installation.

Much is made of the point that while the clock thermostat lowers the indicator at night, the water in a steam or water heating system cools down to such a point that it requires the burning of more oil to raise the water temperature and, consequently, the house temperature, than it would to maintain the temperature during the night at 70°.

The foregoing argument, however, is based upon the assumption that when the indicator is lowered, the oil burner is shut off all night. If this were true, the argument might be sound, but experience teaches that a burner always operates during the night in direct proportion to the heat losses in the home and the outside weather conditions. Also, statistics of the weather bureau show that night temperatures average very close to 15° lower than daytime temperatures, hence if it requires a given amount of oil to raise the daytime temperature in the house to 70°, it will require more oil to maintain the night temperature at 70°, due to the lower outside temperature.

It is very difficult on oil-burner installations to get accurate oil consumption and, therefore, an accurate basis of comparison. For this reason, to settle the question, it is necessary to turn to another and similar field for accurate statistics and proof.

Reliable records of actual fuel consumed over a period of years, together with other valuable data, are found in the field of gas heating. As heating with gas is identical with oil, due to the fact that both usually employ intermittent firing periods, facts that are true with gas heating are equally applicable to oil. In the gas field it has been definitely proven that clock thermostats do save fuel and there are reliable and accurate statistics to prove the fact.

In THE HEATING AND VENTILATING MAGAZINE for July, 1925, in an article by Glenn C. Carnahan, superintendent of the House Heating Department of the People's Gas Light and Coke Company, of Chicago, entitled, "What it Costs to Heat with Manufactured Gas," Mr. Carnahan states:

"A home usually retains enough heat to be comfortable when the outside temperature averages 60° F. for the day. Artificial heat is needed only when the daily average drops below 60° F. From the report of the United States Weather Bureau, we find that the daily average temperature for Chicago is below 60° F. normally between October 7 and May 18, and the normal or average heating season for Chicago is, therefore, a period of 225 days. We also find from these reports that the average temperature for this period is 38.9° F.

"We assume that the average home will be kept at 70° for 16 hours of the day and at 55° for 8 hours of the day. We find that the number of hours the homes are kept at 70° is 224 x 16 or 3,584 hours and at 55° the number is 224 x 8 or 1,792 hours during the heating season.

"Since the amount of heat required is proportionate to the temperature difference between the inside and the outside of the home, as well as to the length of time the heat is required, we estimate the amount of heat required by means of degree-hours. Degree-hours is the product of the difference between the inside and outside temperatures of the home in degree Fahrenheit, times the number of hours heat is required.

"The difference between an inside temperature of 70° and the average outside temperature of 38.9° for the heating season is 31.1°. This average temperature difference is maintained for 16 hours of the day. The average night temperature difference between 55° and 38.9° is 16.1°, which is maintained for 8 hours during the night. The total degree-hours for Chicago will then be 3,584 x 31.1, equalling 111,462.4 plus 1,792 x 16.1, equalling 28,851.2, which is 140,313.6 degree-hours.

"This figure of 140,313.6 degree-hours, if multiplied by the hourly B.T.U. loss of a building per degree difference between inside and outside temperatures, will equal the total heat loss per season, that must be replaced by artificial means in climatic conditions equal to Chicago.

"Since it is customary in many cases to calculate the hourly B.T.U. loss from a building on a basis of 70° F. difference between the inside and outside temperature, then by dividing 140,313.6 by 70, gives us a figure of 2,004, which multiplied by the hourly heat loss, calculated on the basis of a 70° difference, also equals the total heat loss per season. If the B.T.U. loss is figured on 70° inside and minus 10° outside then the figure of 140,313.6 will be divided by 80 which will give the multiplier of 1,754 which should be used when figures on radiation are based on minus 10° outside temperatures.

"Similar constants can be worked out for any climatic condition other than those corresponding to Chicago by use of the U. S. Weather Bureau reports.

"The cubic feet of gas required per season will be yearly B.T.U. loss ÷ B.T.U. per cubic feet × efficiency of heating plant, equals the cubic feet of gas consumed per season.

"The cost of gas per season in dollars will equal the cubic feet of gas required per season times the price of gas in dollars per cubic foot."

It will be noted in the above that exactly the same formula can be applied to oil heating, simply substituting the B.T.U. figure of oil for that of gas.

Analyzing Mr. Carnahan's figures above we find that in the city of Chicago, by reducing to degree-hours, if the temperature is steadily maintained at 70° 24 hours during the day, we must heat 167,193.6 degree-hours; while by lowering the temperature during eight hours of the night to 55° we need only 140,313.6 degree-hours, a saving of 26,880 degree-hours, or 16%. In other temperature zones where the average outside temperature is lower or higher than 38.9°, the savings by clock control will be in direct ratio.

IS THIS THEORY PRACTICAL?

Many theories when reduced to practice are not accurate, due to unforeseen and unexpected factors. The above method of computation, however, has been proved out in actual practice. The People's Gas Light and Coke Company of Chicago use this formula in a monthly checking of actual consumption against estimates. Mr. Carnahan says:

"This can be done with a high degree of accuracy except for the fall and spring months, when, due to wide variation of heat requirements and ventilation, considerable latitude must be allowed. This method is quite accurate for cold weather in spire of the fact that no correction is made for the effects of sunshine and wind velocity or direction.

"The daily figures are kept up to date and each sales engineer keeps them in a note book. Bills then can be discussed intelligently and customers in general seem to understand and believe in the explanation.

"All bills for gas used in central heating plants are checked by this method before they go to the customers. If the check shows that the costs are running much in excess of estimates a thorough investigation of the equipment, and the habits of the users are made.

"The one most common cause for increased consumption of fuel is due to the fact that since the average outside temperature for the heating season in Chicago is 31.1° F., then each degree above 70° maintained in the home increases the fuel consumption 3.2%. Such facts when high temperatures are found are explained, and the customer uses his own judgment."

THEORY APPLIED TO WATER HEATING

If the arguments against clock con-

trol were sound the worst showing would be made on hot water systems. In Mr. Carnahan's article he lists 37 typical hot water jobs running from a frame bungalow exposed, five rooms, with 400 sq. ft. of water radiation, to a three-story brick and frame, well exposed, 23-room residence, with 2515 sq. ft. of water radiation.

A comment made by THE HEATING AND VENTILATING MAGAZINE establishes beyond question, first, the general all-around accuracy of this method of determining fuel consumption and secondly, establishes it as applied to hot water heat. This comment is:

"A most interesting coincidence has developed as the result of analyzing the figures presented by Mr. Carnahan exemplifying the cost of gas heating in Chicago. If we add together all of the gas consumed on all the hot water jobs for the entire season and divide by the total rated load, we find that it required 706.8 cu. ft. of gas per square foot of radiation for the season of 1924-1925.

"If now, we take the curve developed by the American Gas Association and shown in connection with an article entitled "Practical Notes on House-Heating by Gas," in THE HEATING AND VENTILATING MAGAZINE for December, 1924, we find from this curve that the cubic feet of gas per square foot of installed water radiator per degree-day is 0.115. If this is multiplied by 6150, the number of degree-days in the Chicago territory for the heating season of 1924-1925, we find that theoretically there would be required 706.9 cu. ft. of gas for the season. Such remarkable checking is, of course, a coincidence and could not be expected as the usual thing. However, it clearly exemplifies the value of the data developed by the American Gas Association, and the accuracy with which gas consumption in any part of the country may be predetermined."

Tight Longitudinal Joints for Split-Tile Pipe Conduits

The endless problem of fuel saving by no means stops with the steam-generating plant. Efficient as the boiler equipment may be, it is obvious that its economies are futile if the steam is not delivered to its point of use with the lowest possible distribution losses.

There are four requirements of the utmost importance in the design of insulation and protection for underground steam lines.

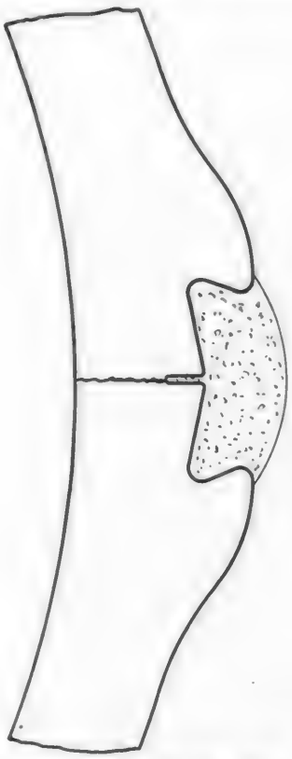
(a) Covering material must be a good heat insulator.

(b) Protective covering must be waterproof.

(c) The entire insulation must be constructed of materials that do not deteriorate in the ground either due to heat from the steam lines or from any moisture that may be present.

(d) The insulation must be of a character such that if it gets wet it will dry out without damage to its insulating properties.

In an extensive street installation in a large city such as Cleveland perhaps the most important item mentioned above is the second. Water lines have many leaks, and unless these leaks are large, they go unnoticed and sometimes continue for years. Under-draining the steam lines will help this situation materially, but still it is of the greatest importance that the protective covering around the insulation be waterproof.



Construction of Split-Tile Pipe With Special Fins on Side for Sealing With Concrete

The principal objection to split-tile or channel-pipe construction has been the trouble in making tight, longitudinal joints. A thin, cement grout has been applied to the rough edges, but has not always proved satisfactory, as it is almost impossible to keep some dirt off these edges, particularly on a windy day. Also this grouting necessitates having a fine screened sand and a special mix of cement on the job. Furthermore this cementing must be done as the top half of the channel pipe is placed which is inconvenient and at time not possible.

To overcome this situation a channel pipe with special fins or lips on the sides, shown in the accompanying illustration, is now being successfully used. The space between these fins is filled with ordinary concrete, thus sealing the joint, and on account of the special construction of these fins, tying the two halves together permanently in all directions and making an exceptionally strong joint which is visible and readily inspected. This concreting may be done any time it is convenient after the tops are placed. Repeated tests made by filling a ditch one foot over the top of this type of construction and then puddling same have shown on digging up again that this joint is absolutely watertight.

The standard construction in Cleveland is to install this special tile or conduit on top of a special drain tile which serves also as a support for the conduit.—CHARLES H. DAY, *Superintendent of Heating, Cleveland (O.) Electric Illuminating Company.*

Researches in Mine Ventilation

A symposium on underground ventilation is being undertaken by the Mine Ventilation Committee of the American Institute of Mining and Metallurgical Engineers. In a letter sent out recently by this committee, a list of suggested subjects is included for the use of the various sub-committees, with the hope that each sub-committee will prepare a paper on the subject assigned to it for presentation at the next annual meeting of the Institute.

Under coal mine ventilation, the subjects listed include exhaust versus pressure regulation, limitations of exhaust method of ventilation in gaseous mines, limitations in splitting the ventilating current from the standpoint of decreasing the velocity to an undesirable point, location of main fans on the surface, location and general type of booster and of auxiliary fans and method of driving, and whether reversing of the air current should be provided for. Separate lists are made up for metal mine ventilation, and other lists relate to physiological studies of air, fans, and physics of ventilation.

Closer Contact Proposed Between Trade and Engineering Associations

The Washington convention provided for the establishing of a point of contact between several other associations allied with the building industry and ours by the appointment of a representative to work with representatives of these, discuss matters of mutual interest and recommend whatever action may be necessary.

Representatives were appointed to the American Institute of Architects, American Zinc Institute, National Slate Association, Sheet Metal Branch of the National Hardware Association, National Warm Air Heating & Ventilating Association, American Society of Heating and Ventilating Engineers. None of these appointed representatives to our association.—*National Secretary, Edwin L. Seabrook, before the National Association of Sheet-Metal Contractors.*

American Society of Heating and Ventilating Engineers

The New Director of the Research Laboratory

The appointment is announced of Secretary F. C. Houghten, of the American Society of Heating and Ventilating Engineers, as director of the A. S. H. & V. E. Research Laboratory in Pittsburgh. Mr. Houghten has already gone to Pittsburgh where he will maintain his headquarters. He thus returns to the scene of his former work where, as first assistant to Dean Anderson, he conducted important investigations, from 1920 to 1923, of a number of problems of heating and ventilation.

F. C. Houghten
The New Director of the A. S. H. & V. E. Research Laboratory

Mr. Houghten first became associated with the A. S. H. & V. E. Research Laboratory through his research work while with the Bureau of Mines. During the war period he was in charge of the Bureau's Physical Laboratory as physicist. Later he had charge of investigations of transmission of heat through boiler tubes and of an investigation conducted by the Bureau of Mines of heating and cooking devices used in the army. He also had charge of research work on combustion and heat transmission in large, low-pressure heating boilers.

His association with the A. S. H. & V. E. Research Laboratory dates from 1920, when he was employed by the late Director John R. Allen. Some of his more important work under Dean Allen was in connection with heat transmission through building materials, cooperating in this work with the Pennsylvania State College. Other problems in his investigations included the flow of steam in pipes, ozone and air-conditioning, and the effect of temperature, humidity and air motion on human beings. Mr. Houghten has been secretary of the society since 1923.

In an announcement of Mr. Houghten's appointment, issued by the Committee on Research, of which William H. Driscoll is chairman, the committee goes on to state that "after many months of thought and effort on the part of your committee, after consideration of the names of many individuals as prospective directors for our Research Laboratory, after special committees had labored over the problem and when despair of ever reaching a satisfactory conclusion had come over the committee, we have found in our own family circle the man who, we are satisfied, understands the problems of the directorship, has the cap city and the ability to handle them and has that intense interest in the Laboratory and its work which is so essential to the successful handling of its problems."

"Ferry C. Houghten," continues the committee's statement, "now serving the society most excellently as secretary, has loomed up as the outstanding candidate for the position. Mr. Houghten kept as far in the background as possible while the committee struggled with the problem, feeling that it would be quite improper for him to make the slightest effort to gain the appointment while serving the society as its secretary."

"Mr. Houghten," adds the statement, "is essentially a worker—the kind who is so intent on doing the job in hand that he makes the impression through the work that he does, rather than by the personal enthusiasm that he creates. He is of the Coolidge type—calm, cautious and confident, the kind of a man who is apt to be overlooked, but when discovered, produces results that far exceed all expectations."

Announcement of the program to be put into effect at the Research Laboratory, it is stated, will be made to the society at the earliest possible moment.

Bringing the Convention Back to the Home Office

An effective way of giving those who could not attend their trade convention the benefit of the proceedings has been carried out by Davis S. Boyden, of the Edison Electric Illuminating Company of Boston. Immediately upon Mr. Boyden's return from the convention of the National District Heating Association, in West Baden, Ind., last June, he arranged to reproduce the convention on a small scale for the benefit of the entire heating department of the company. A program was arranged to occupy a whole day and sessions were held in the library of one of the company's service buildings.

All of the important papers and reports were presented, either in full or in abstract, different officials of the department being assigned the subjects in their respective fields. Mr. Boyden presided. Due to the fact that he had been present at the main convention, he was able to give the smaller gathering much of the "color" and enthusiasm of the original meeting.

Correspondence

Use of Central Vent Flues In Corridors

EDITOR HEATING AND VENTILATING MAGAZINE:

Is it permissible in New York State in public school building work to eliminate individual vent flues in classrooms and exhaust the air through grilles in the doors to the corridors and thence through a single large flue?

New York. O. W. E.

No, it is not. In a ruling on this point, received from Frank H. Wood, director of the School Buildings and Grounds Division of the State Department of Education, Mr. Wood states:

"Under our building code it is not permissible to install a central vent flue in a corridor with grills in the classroom doors, instead of separate vents from each classroom."

Sluggish Circulation of Water Due to Slight Motive Head

EDITOR HEATING AND VENTILATING MAGAZINE:

I am enclosing a sketch of a garage water heating system. This system is under 80 lbs. pressure and is fed from a ½-in. city water pipe direct into the return at the jacket heater. The total length of the piping distance from the jacket heater to the wall radiator is 80 ft. The top of the radiator is almost level with an air vent tee on the feed line above the jacket heater. Will you kindly give me the reason why this system circulates so slowly?

Hamilton, Ont. H. R. F.

Water circulates in the system in question, not because of the city water pressure referred to, but because of the difference in weight of two columns of water, one of which is in the return from the radiator and therefore colder and heavier than the other which is in the vertical flow pipe from the heater.

Suppose we have two columns of water at 180° F. temperature, each in a pipe of equal size about 10 ft. high. With one of the columns cooled to 140° we would find that the latter column would contract perceptibly, enough so that the water column would lower about 1½ in. The two columns, though unequal in height, are equal in weight and would balance one another, but if enough water were added to make up the difference in height between the two columns, the column of water at 140° would be heavier than the one at 180°. This would cause the water to lower in the return pipe, thus forcing the hotter and lighter water* up in the flow pipe. In other words, the space in the flow pipe contains less weight of water at 180° than an equal space contains at 140° in the return pipe. If the water in the flow pipe was not continually being heated by the heater, the two columns of water would soon equalize in temperature and cease to circulate.

Anything that will increase the difference in weight between the two columns of water will increase the circulation and this may be done either by having colder water in the return pipe or by increasing the height of the two columns. For example, if the flow pipe were carried up to the roof of the house and then down to the point where it leaves for the garage the cooling effect of the long pipe going down would help the circulation to a great extent, particularly if the down pipe were left uncovered. The effect can be even further increased by discharging the cold return water from a radiator on the top floor into the down pipe.

As the installation is now made, water in the slight drop of pipe at "A" is cooler than that in the vertical flow pipe at the heater, hence it lowers, while water in the return pipe from the radiator is still colder and heavier than that in pipe "A". Likewise it, in turn, lowers and forces the hotter water around the circuit. The small difference in height is what causes the slow circulation, particularly when starting up, at which time the water is at an even temperature throughout the system. For this reason a starting pipe as shown dotted at "B" could be used to assist in establishing an initial circulation between flow and return headers before the water in the mains is moving; in fact, such a pipe is occasionally used in gravity water heating systems even

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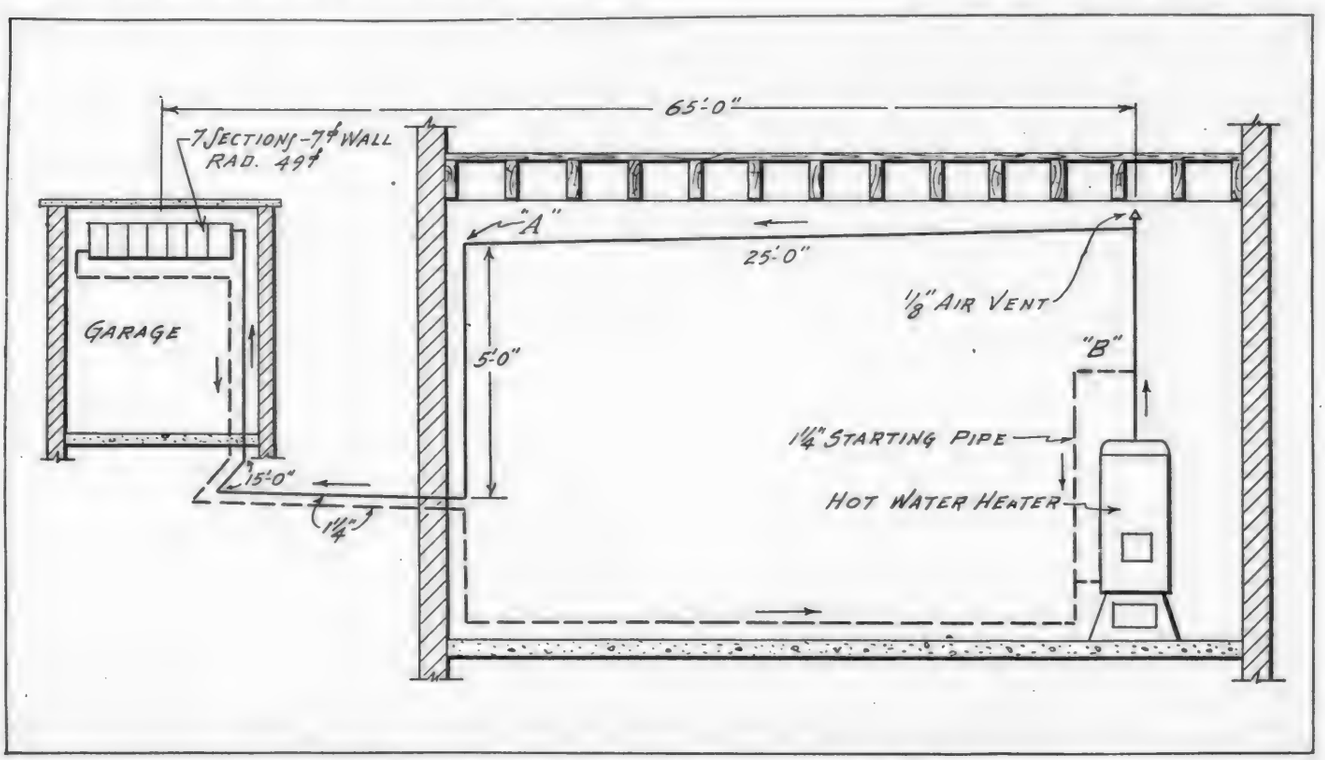
* We are accustomed to say that hot water rises when in reality it is forced up by the cold water lowering due to its greater weight.



Garage Water-Heating Plant Which Gave Trouble Due to Sluggish Circulation

where the system is quite the usual and contains no difficulties such as those cited. Connect this pipe well up on the flow pipe so as to obtain maximum circulation.

It would have been better had the flow pipe been pitched up to point "A" and the air vent installed at this point to vent the pipe before it dropped. However, if this is not a closed system the air should be vented by extending the flow pipe directly up to the expansion tank. The drop pipe at "A", as well as the vertical return pipe should not be covered. Of course, all pipes should be of ample size and have proper pitch in the right direction.

Solving such problems as these is not difficult if the principle of circulation is kept in mind and care is taken to vent the piping properly. This kind of problem, with all variations, was recently detailed at length, with illustrations, in THE HEATING AND VENTILATING MAGAZINE for November, 1924 and January and April, 1925.

Size of Boiler and Pipe Coil Required for Heating Water

EDITOR HEATING AND VENTILATING MAGAZINE:

Will you kindly give us the size of boiler necessary to heat a 315-gal. open tank, filled with water, from 60° to 212°, in one hour, with steam at 5 lbs. pressure, the heater to be equipped with a coil?

New York. A. R. B.

It would be necessary to know the particular make of boiler in mind before the proper size of boiler could be determined, as present-day boiler ratings are a problem in themselves. However, the load in equivalent direct cast-iron column radiation may easily be determined as follows:

Gallons of water × weight in pounds × temperature rise, divided by 250 B.T.U., the transmission per square foot of direct cast-iron radiating surface, or $315 \times 8.33 \times (212° - 60°) \div 250 =$ 1595 sq. ft. of radiating surface.

The square feet of coil surface required would be figured as follows:

Divide the heat units required to heat the water as figured above by the product of the transmission per square foot of coil surface times the difference in temperature between that of the steam and the average or mean temperature of the water, thus:

$$\frac{1595 \times 250}{130 \times \left(227° - \frac{212° - 60°}{2}\right)} = 34 \text{ sq. ft.}$$

of coil surface.

The transmission of 130 B.T.U. per square foot of coil surface is for iron pipe placed horizontally in the water. The transmission for brass or copper coils would be 190 B.T.U. making 23 sq. ft. of coil surface required, or if the pipes were placed vertically in the tank, these transmission factors would become 170 and 230 B.T.U., respectively, and the coil surface required, 26 and 19 sq. ft., in the same order. The lineal feet of coil, if of 1½-in. pipe, would be twice that of the above figures.

Tests would show these factors to be somewhat higher, but the above figures are conservative, making allowance for fouling of the pipes and the low velocity of water that would obtain in an open tank, in fact it would be much wiser to increase these amounts somewhat as it is doubtful whether the water can be readily heated to a final temperature so near that of the steam. Some allowance should also be made for the heat loss from the open tank.

Second Printing of "House Heating With Oil Fuel"

When the second edition of "House Heating With Oil Fuel" was prepared, only four months ago, it was hoped that it would meet a demand at least as great as had its predecessor, in view of the addition of much new and valuable matter. Twice as many copies were printed, but in less than four months the entire printing has been exhausted, and several hundred orders have accumulated. A second printing is now ready for distribution. Certain revisions have been made, notably to bring the regulations of the National Fire Prevention Association in line with the recent accepted formulation, and to add to the list of approved domestic burners those "listed" by the Underwriters since the first printing.

Many gratifying letters and verbal expressions have been received in regard to this publication from those prominently identified with the oil burner industry, including C. H. Chalmers, president of the American Oil Burner Association, and executives of many oil-burner manufacturing concerns. The book has been purchased in quantities by several manufacturers for use by their agents, and in more than one instance it has been so used by a manufacturer whose product was neither pictured nor described in it. One manufacturer used the book as a sales argument, inviting the prospect to use it as an unbiased source of information, and then form his own opinion of the merits of the burner.

An interesting slant has been afforded by the fact that several hundred copies have been individually sold to coal dealers, or those in the coal industry, and in one case three successive orders for a quantity of the books were received from one coal company. One letter from the "———— Coal Company, Coal and Coke, Wholesale and Retail," ordering two copies concluded with: "We're in the fuel-oil game."

As a possible reflex of this publication, the author, P. E. Fansler, associate editor of THE HEATING AND VENTILATING MAGAZINE was asked to prepare an article on residential oil burning for *Good Housekeeping Magazine*, with its circulation approaching two million, and this developed into two display stories, one of which appeared in the September issue, and the other will follow in October. Mr. Fansler has also prepared for the *Good Housekeeping* Institute a bulletin on the same subject.

From the above, and taking into account the fact that every issue of the magazine includes one or more articles having to do with the subject of domestic oil burners, it will be apparent that HEATING AND VENTILATING MAGAZINE is cognizant of the potentiality of this infant industry, and is appreciative of its position as a factor in the heating field.

Large Oil Storage Tanks Are Being Jacketed

One of the large oil companies has adopted a unique scheme of cutting costs by covering the sides of its steel storage tanks with a felt jacket. Vertical battens are placed around the tank, running felt jackets to the battens in horizontal strips extending around the tanks, each being lapped slightly over the one below. Experiments made last winter determined the value of jacketing the tanks as it was found that the heat could be maintained in the tanks over a much longer period than when unprotected. Inasmuch as heavy oils are stored, whose handling is impaired by cold weather, this jacketing represents real saving. In winter weather in Ohio water could be settled out of the protected tanks, but those not covered would require heat. This time of the year the temperature of the oil, when it comes from the ground, is high enough to do away with heat if it is admitted immediately in a jacketed tank, otherwise it must be heated to settle out the water and handle it.

Movie House Locates Heating Boilers on Roof

Novel practices in heating and ventilating design have been adopted in the Capitol Theatre of London, generally regarded as the most luxurious and perfectly-equipped motion picture house in Europe. The entire system is fired by city gas in a tubular gas boiler. By using gas the theatre has also aided the "brighter London" movement to eliminate the smoke nuisance.

One of the most interesting features of the installation is the fact that the gas boilers are placed on the roof where they are entirely out of the way. As the result the basement and part of the first floor are made available for other and more remunerative purposes, as well as the space ordinarily required for coal and ashes.

Seattle's Electric Heating Era

A RATE for electricity in Seattle, Wash., of 1 cent per kilowatt-hour, recently put into effect, marks the beginning of a great era of electric heating, according to the 1924 report, just received, of the Seattle (Wash.) Department of Lighting, J. D. Ross, superintendent. According to the Department, there are now about 200 houses electrically heated in Seattle, 150 of which have been connected in the "last ninety days." One firm alone has commenced building 300 electrically heated homes.

There is about 4000 K.W. used in the 200 homes and another 2000 K.W. in reflecting heaters scattered throughout the city. There are about 1000 water heaters using, in summer, about 3000 K.W. About 30 K.W. per day is now being connected for water heaters alone. The Department is encouraging the use of water heaters, but though very desirous of the load, is leaving the decision on the use of electric heat to the customer, believing that unless there is current available for all, it is impossible to guarantee perpetual service. In the meantime, the heating load is doubling every few months and, the report states, could easily be increased to enormous proportions so fast that it could not possibly be cared for with the present plant.

The Department's view of the matter is that if the city's vision could be turned to the development of large power units in time for the demand, the city could have electric heating for many years to come. The antagonism of the power companies, it is claimed, who themselves will not develop power unless immediate dividends are in sight, are largely responsible for the delay in financing Seattle's municipal system.

As an example of what could be done, the Department cites the Federal report on the Umatilla project, with its capacity of 420,000 H.P. and its estimated cost of electricity at the point of production of 1.2 mills per kilowatt on 100% load factor, or $10.51 K.W. per year, which is equal to 2 mills on a 60% load factor. The load factor of heating installations, it is pointed out, would not average much above 25%, while the portion used for irrigation and other farm uses would average 40%. The addition of metallurgical and other farm uses would increase the load factor so that it could easily be raised to 60%.

Seattle, according to the Department of Lighting, could easily use 200,000 H.P. for heating, which would heat about one-tenth of the present city. The Department's report goes into the possibilities in detail and concludes with the statement that "the delivery of current within the city of Seattle at 7.5 mills for heating is easily possible, and there need be no extra charge for this to the customer. His contract would call for a flat charge of $15.67 per kilowatt year, plus the kilowatt-hours used at 7.5 mills above the 25% load factor. The market for this power at this rate is practically unlimited. The rising price of fuel and low cost of operation make electric heating more eagerly sought each year."

Steam Wastes in Heating Systems

While it is possible, of course, to waste unlimited quantities of steam in a heating system, figures obtained from actual installations designed to operate with reasonable efficiency have shown in some cases a consumption of up to 1000 lbs. per season per square foot of radiation. When it is considered that this figure may be readily brought down to one-half that amount, or 500 lbs. and give all of the heating effect required, the importance of some automatic heat control is appreciated.

As a matter of fact, a square foot of direct radiation should and normally will, without waste, condense 400 lbs. of steam per season. Many radiators are doing better than this where buildings are well constructed and where the night temperatures are maintained at a fairly low point. In a well-constructed building it is possible to maintain considerably lower night temperatures than in a poorly-constructed building. The "heat capacity" of the walls tells us how far we may lower the night temperature to get the greatest economy.

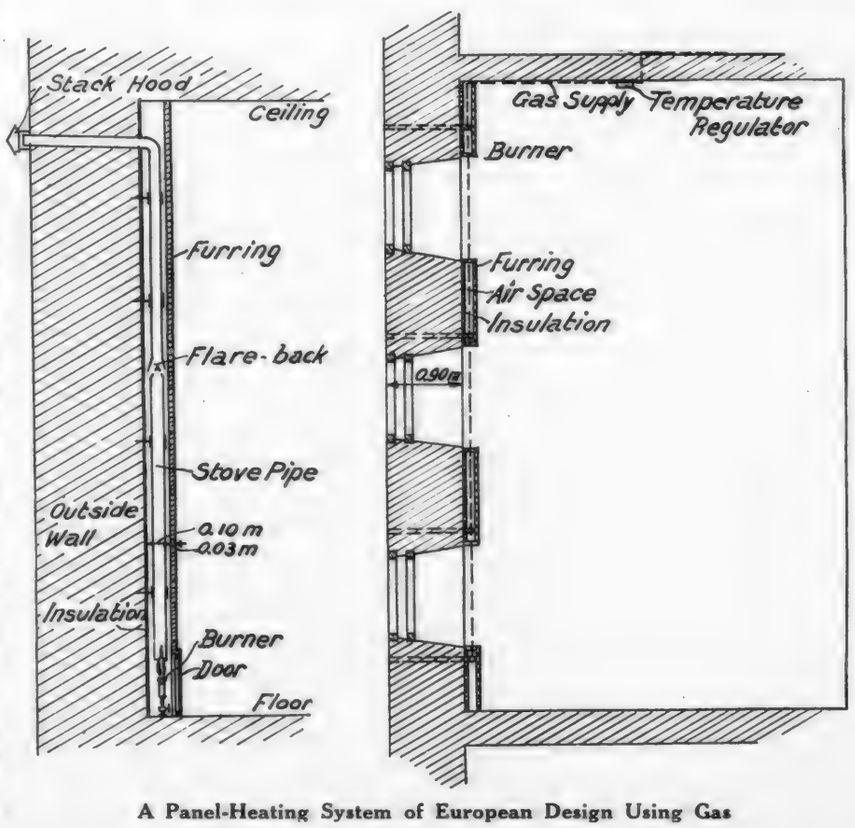
No manual control can possibly be on the job so continuously as to shut off the steam at exactly the right time and turn it on again in the same manner. If it could the cost would be too high.

Gas Industry Provides for Possible Coal Shortage

"The gas industry may have its deficiencies, but no one can accuse it of not taking steps to safeguard its customers in the domestic, the house heating and the industrial fields against any fuel want in case a strike occurs and a coal shortage results," Floyd Parsons recently told a gathering of gas salesmen and engineers. "If I were selling gas to industrial users, or it devolved upon me to plead the case of the gas industry before any important public commission, I would be sure to include as one strong argument the statistical record of the industry's coal purchases prior to the happening of each coal mining emergency."

European Design for Panel Heating with Gas

A scheme of panel heating with gas is reported by a writer in *Gesundheits Ingenieur* and is shown in the accompany-



A Panel-Heating System of European Design Using Gas

ing illustration. An air space is built in the outside walls with a layer of insulating material between. In this space can be placed any heating device, but gas heaters are especially adaptable.

The illustration shows an installation by Professor Strache, in a building in Austria. The gas burner is located at the base of the air space. It is accessible through a small door and is regulated by a thermostat. The flue gases rise through regular stove pipes, including back draft diverters, and are led directly to the outside of the wall. This method follows, in a general way, that described by an English writer in THE HEATING AND VENTILATING MAGAZINE for November, 1924.

Where Coke Fits Into The Fuel Conservation Movement

TO properly approach this subject we must first refresh our memories on what gas coke is. We are all familiar with soft coal from which coke is made. We also know that soft coal from various sections of the country comes in various structures and different qualities. Some are high in volatile matter, that is, the gas content or such particles that are driven off by applying heat to the coal and, in a more technical sense, the materials that are passed off by distillation, as is the process in coal gas plants or coke oven plants. After this volatile matter is driven off, the residue is the fixed carbon content which remains as coke. It is pure carbon, with the exception of the ash content.

The percentages of the volatile and fixed carbon vary with the different sections of the country. As the gas industry is interested in both of these, they select what they term the better grades of coal to obtain the highest amount of these two elements. As a rule, they pay a premium for obtaining coals of this quality.

For this reason the coal used by the various gas and coke oven companies in this section of the country (Grand Rapids, Mich.) comes from eastern Kentucky and West Virginia and parts of Pennsylvania. These coals, commonly termed "gas coal," will contain about 57% of fixed carbon, 38% volatile and the balance divided between ash, sulphur and other minor ingredients.

It is necessary for the gas and coke industry to have a low ash coke, which means also that there must be practically no sulphur content. The coal used by the Grand Rapids Gas Light Company will have as low at 4½% ash content on the average, while a great portion of this coal will come through an analysis at about 21½% ash content. We see, then, that when this coal is distilled and the volatile is driven off by distillation, as in gas containing tar and ammonia, the 57% left as fixed carbon contains only 3% or 4% ash.

Now we see what we have for use in the fuel bins in our basements for the heating of our homes. In gas works all the soot and dirt have been taken out by the distillation process and collected and purified for other purposes. The remainder has been very carefully prepared and sized and is ready for delivery for domestic use. When we buy this gas coke we have only the fixed carbon or heat-producing fuel without all the disagreeable features of coal.

Having passed through this process it has gained in bulk or rather lost in weight. The original coal weighs approximately 50 lbs. per cubic foot, whereas this coke weighs but 32 lbs. per cubic foot. While this means more fuel space in the basement, on the other hand it is easier to handle. However, we find that where our directions are followed, it is unnecessary, except in very extreme temperatures, to attend the heater more than twice daily.

To sum up the advantages of coke as a domestic fuel, we have the following points:

1. The consumer is paying for fuel value only and not for quantities of ash and slate.
2. He has a fuel that is easily handled due to its light weight.
3. Gas coke is a fuel that does not require a long time to heat up.
4. Dangers from roof fires are eliminated. (Your fire department records will show you what percentage of the calls answered are of this nature—they are high.)
5. No dust or soot is deposited on the surrounding neighborhood.
6. The cost of redecorating or cleaning is greatly reduced.
7. The health of our children to whom we owe our greatest care is not impaired.
8. Our smoke inspectors will have to look for new worlds to conquer.—GUY M. HALLIDAY, *Grand Rapids Gas Light Company, before the Smoke Prevention Association, in Grand Rapids, Mich., June* 17-20, 1925.

Saving Heat By Recirculating Filtered Air In A Tool Room

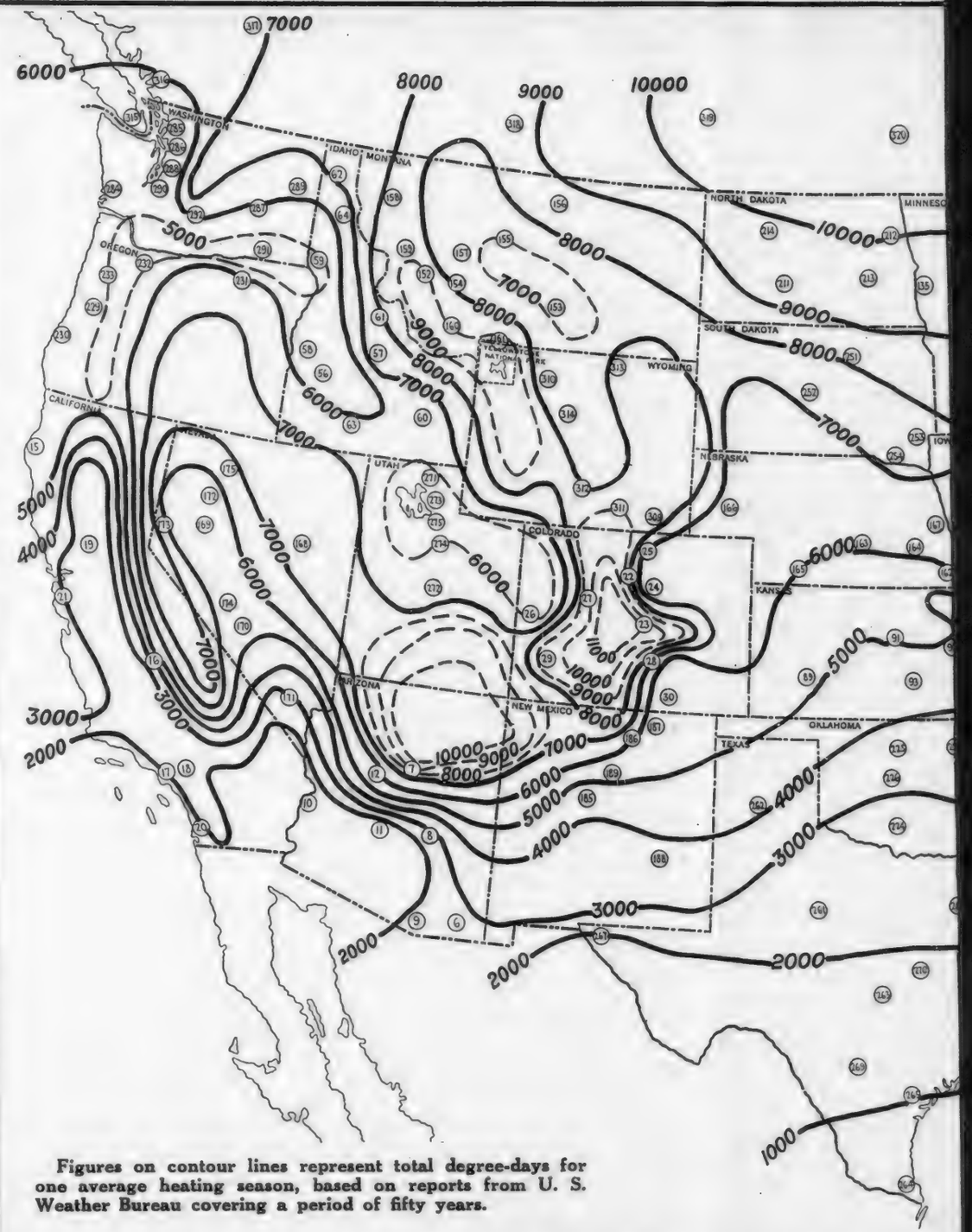
An interesting use of dry air filters for permitting the recirculation of air in a tool room containing individual grinding and buffing machines is shown in the accompanying ilustrations. The individual machines themselves are provided with hoods in the usual way and a central fan pulls the air away from the machine and into the sheet-metal dust collectors shown in the illustration. These collectors do nothing more than collect the rough dust.

The air stream, still in a dusty condition, is then made to pass through the dry air filters, which are of the Midwest type (shown at the rear of the room near the windows) and thence back into the room.

Even in a comparatively small room there is an appreciable amount of heat saving by this method of recirculation. Again, in the summer months the filters are used to advantage in preventing the process dust from spreading about the plant.

Use of Dry-Air Filters in a Tool-Room Permitting Recirculation of Dusty Air

No.		Degree-Days
	ALABAMA	
1	Birmingham	2527
2	Gadsden	3006
3	Mobile	1439
4	Montgomery	1898
5	Tuscaloosa	2529
	ARIZONA	
6	Bisbee	2706
7	Flagstaff	10913
8	Globe	2575
9	Nogales	2497
10	Parker	1517
11	Phoenix	1446
12	Prescott	5060
	ARKANSAS	
13	Hot Springs	2665
14	Little Rock	2861
	CALIFORNIA	
15	Eureka	5021
16	Fresno	2375
17	Los Angeles	1517
18	Pasadena	2066
19	Sacramento	2525
20	San Diego	1582
21	San Francisco	3450
	COLORADO	
22	Boulder	5665
23	Colorado Springs	10089
24	Denver	5880
25	Fort Collins	6877
26	Grand Junction	5570
27	Leadville	11005
28	Pueblo	5671
29	Telluride	9372
30	Trinidad	5439
	CONNECTICUT	
31	Hartford	6124
32	New Haven	6039
33	New London	6040
34	Waterbury	5661
	DELAWARE	
35	Dover	4539
36	Seaford	4507
37	Wilmington	4813
	DISTRICT OF COLUMBIA	
38	Washington	4562
	FLORIDA	
39	Gainesville	791
40	Jacksonville	1080
41	Lake City	955
42	Orlando	389
43	Pensacola	1288
44	St. Petersburg	175
45	Tallahassee	1421
	GEORGIA	
46	Americus	1862
47	Athens	2691
48	Atlanta	2880
49	Augusta	2178
50	Brunswick	1269
51	Gainesville	3259
52	Macon	2220
53	Rome	3078
54	Savannah	1517
55	Waycross	1470
	IDAHO	
56	Boise	5657
57	Challis	8074
58	Emmett	5587
59	Lewiston	4924
60	Pocatello	6459
61	Salmon	7866
62	Sandpoint	7857
63	Twin Falls	6600
64	Wallace	7228
	ILLINOIS	
65	Aurora	6661
66	Cairo	4053
67	Chicago	6007
68	Decatur	5485
69	Olney	4751
70	Peoria	6146
71	Rockford	6847
72	Springfield	5495
	INDIANA	
73	Evansville	3355
74	Fort Wayne	5927
75	Indianapolis	5331
76	Lafayette	5241
77	Marion	5768
78	Richmond	6060
79	South Bend	6313
80	Terre Haute	4920
	IOWA	
81	Algona	7594
82	Burlington	6261
83	Clinton	6628
84	Des Moines	6464
85	Dubuque	6744
86	Fort Dodge	6753
87	Marshalltown	7103
88	Waterloo	7152
	KANSAS	
89	Dodge City	5035
90	Leavenworth	4795
91	Salina	5030
92	Topeka	5282
93	Wichita	4675

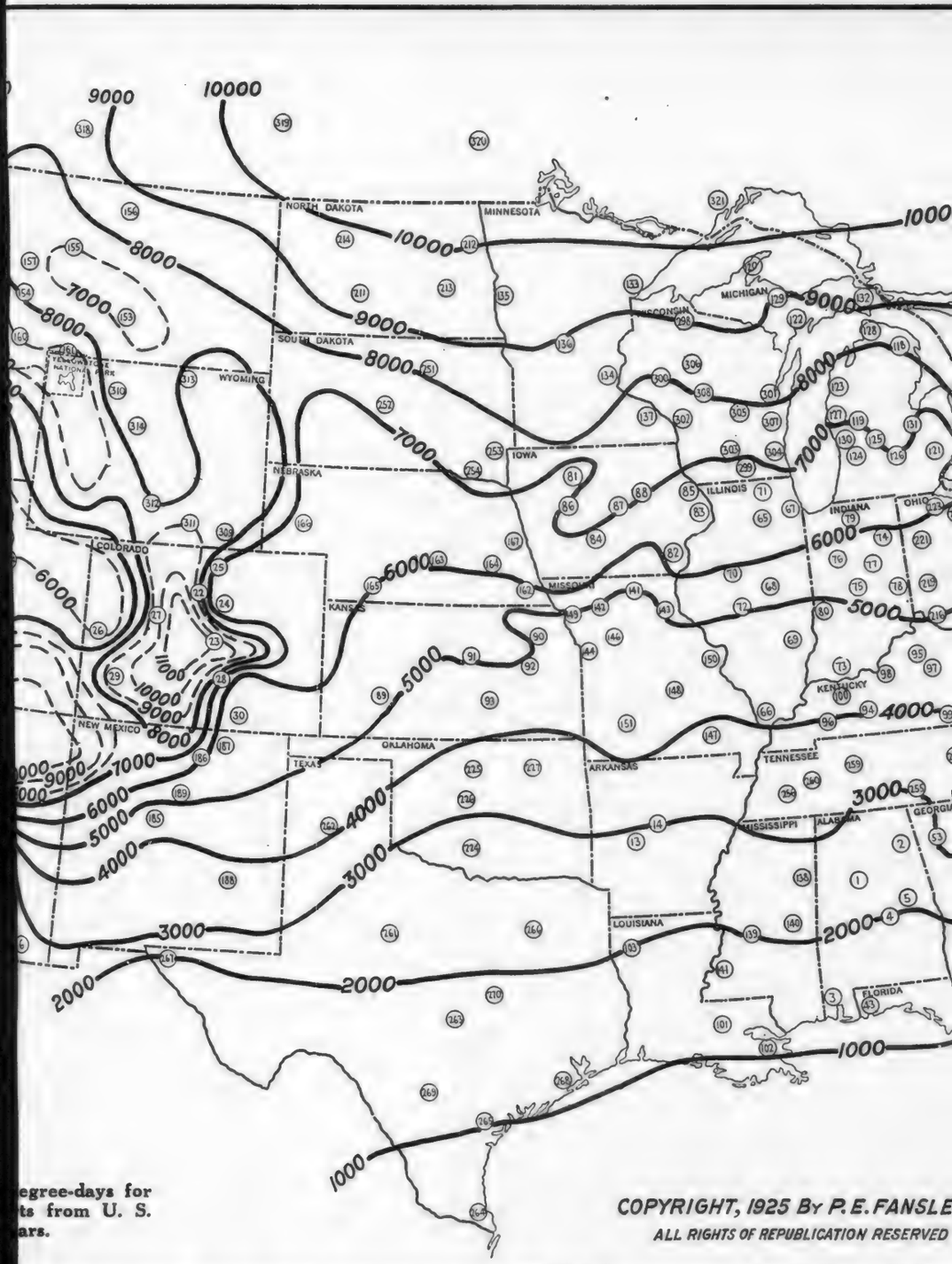


Figures on contour lines represent total degree-days for one average heating season, based on reports from U. S. Weather Bureau covering a period of fifty years.

	KENTUCKY	
94	Bowling Green	3883
95	Frankfort	4241
96	Hopkinsville	3846
97	Lexington	5250
98	Louisville	4366
99	Middlesboro	3977
100	Owensboro	4179
	LOUISIANA	
101	Baton Rouge	1206
102	New Orleans	1044
103	Shreveport	2097
	MAINE	
104	Eastport	8676
105	Gardiner	7587
106	Lewiston	7502
107	Portland	7267
	MARYLAND	
108	Annapolis	4482
109	Baltimore	4591
110	Cambridge	4273
111	Frederick	4926
112	Frostburg	5613
113	Salisbury	4223
	MASSACHUSETTS	
114	Boston	6055
115	Lawrence	6682
116	Lowell	6504
117	Springfield	6464
	MICHIGAN	
118	Alpena	8319
119	Big Rapids	7440
120	Calumet	9217
121	Detroit	6202
122	Escanaba	8904
123	Frankfort	7590
124	Grand Rapids	6613
125	Greenville	7037
126	Lansing	6957
127	Ludington	7185
128	Mackinaw	8461
129	Marquette	8866
130	Muskegon	6922
131	Saginaw	7080
132	Sault Ste. Marie	9707
	MINNESOTA	
133	Duluth	9650
134	Minneapolis	7953
135	Moorhead	9495
136	St. Cloud	8687
137	Winona	7515
	MISSISSIPPI	
138	Aberdeen	2743
139	Jackson	1920
140	Meridian	2527
141	Natchez	1667
	MISSOURI	
142	Chillicote	5017
143	Hannibal	5303
144	Kansas City	5302
145	Kirksville	5799
146	Marshall	5042
147	Poplar Bluff	3914
148	Rolla	4671
149	St. Joseph	5289
150	St. Louis	4588
151	Springfield	4650
	MONTANA	
152	Anaconda	9158
153	Billings	6983
154	Butte	8262
155	Great Falls	7222
156	Havre	
157	Helena	
158	Kalispell	
159	Missoula	
160	Virginia City	
161	Yellowstone	
	NEBRAS	
162	Falls City	
163	Grand Island	
164	Lincoln	
165	McCook	
166	North Platte	
167	Omaha	
	NEVA	
168	Eureka	
169	Fallon	
170	Goldfield	
171	Las Vegas	
172	Lovelock	

ISO-DEGREE-
OF THE UNITED STA

In the derivation of data from which these iso-degree-day lines were drawn, reports o
fifty years, were used, and as many points plotted. The list as printed has been sh
Over 12,000 calculations were required to make possible the presentation of this c



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SO-DEGREE-DAY CHA

OF THE UNITED STATES AND CANADA

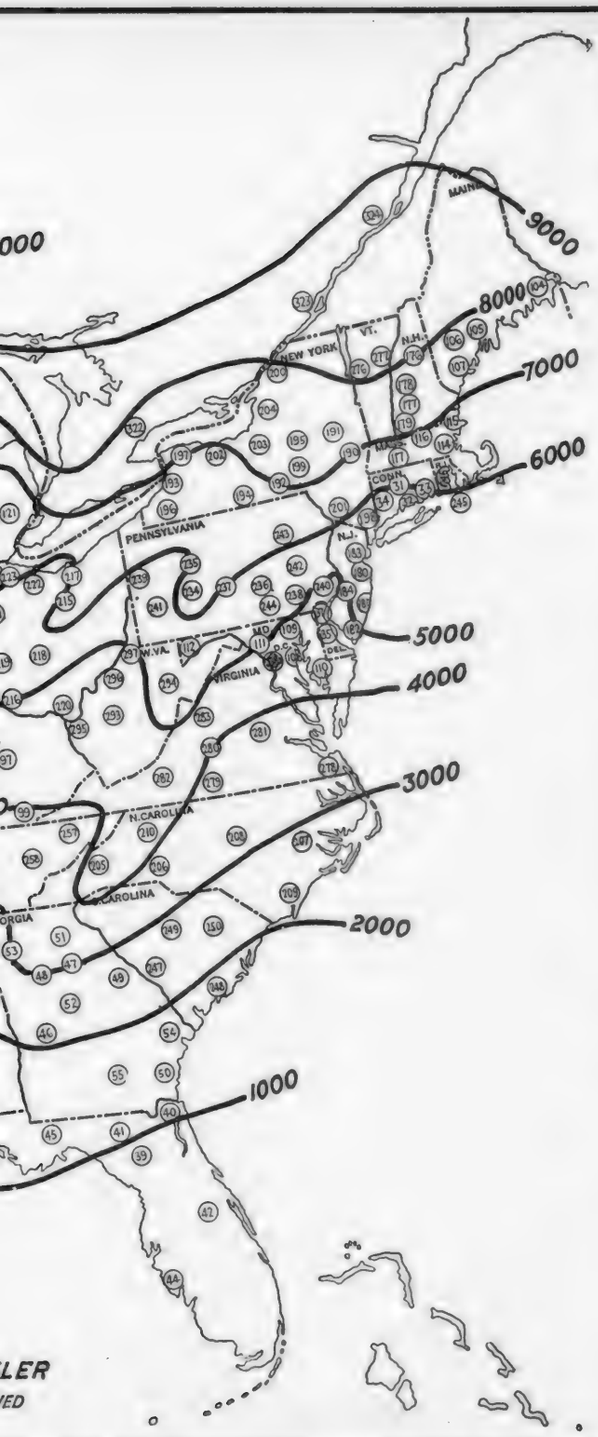
data from which these iso-degree-day lines were drawn, reports of the U. S. Weather Bureau from nearly 500 statio
d, and as many points plotted. The list as printed has been shortened, to eliminate points of little importance excep
tions were required to make possible the presentation of this chart.

...	8904
...	7590
...	6618
...	7037
...	6957
...	7185
...	8461
...	8866
...	6922
...	7080
...	9707
...	9650
...	7953
...	9495
...	8687
...	7515
...	2743

139 Jackson	1920
140 Meridian	2527
141 Natchez	1667
MISSOURI	
142 Chillicote	5017
143 Hannibal	5303
144 Kansas City	5302
145 Kirksville	5799
146 Marshall	5042
147 Poplar Bluff	3914
148 Rolla	4671
149 St. Joseph	5289
150 St. Louis	4588
151 Springfield	4650
MONTANA	
152 Anaconda	9158
153 Billings	6983
154 Butte	8262
155 Great Falls	7222

156 Havre	8608
157 Helena	7764
158 Kalispell	8261
159 Missoula	8324
160 Virginia City	8682
161 Yellowstone Park	9723
NEBRASKA	
162 Falls City	5197
163 Grand Island	6084
164 Lincoln	6231
165 McCook	5801
166 North Platte	6479
167 Omaha	6127
NEVADA	
168 Eureka	7072
169 Fallon	5676
170 Goldfield	5556
171 Las Vegas	2827
172 Lovelock	5710

173 Reno	5894
174 Tonapah	6069
175 Winnemucca	6266
NEW HAMPSHIRE	
176 Berlin	8867
177 Concord	7335
178 Franklin	7537
179 Keene	7338
NEW JERSEY	
180 Asbury Park	5390
181 Atlantic City	5250
182 Cape May City	4821
183 Long Branch	5393
184 Trenton	5033
NEW MEXICO	
185 Albuquerque	4401
186 Cimarron	5872
187 Raton	5980



ART

DA

ations, and covering a period of
xcept as used to locate the lines.

P. E. F.

188	Roswell	5309
189	Santa Fe	6064

NEW YORK

190	Albany	6542
191	Amsterdam	7494
192	Binghampton	6882
193	Buffalo	6750
194	Elmira	6041
195	Ithaca	6917
196	Jamestown	6740
197	Lockport	6502
198	New York	5303
199	Norwich	7321
200	Ogdensburg	7592
201	Port Jervis	6310
202	Rochester	6834
203	Syracuse	7269
204	Watertown	7396

NORTH CAROLINA

205	Asheville	4410
206	Charlotte	3153
207	Newbern	2580
208	Raleigh	3287
209	Wilmington	2493
210	Winston-Salem	3904

NORTH DAKOTA

211	Bismarck	8498
212	Grand Forks	9724
213	Jamestown	8825
214	Minot	9591

OHIO

215	Akron	6188
216	Cincinnati	5302
217	Cleveland	6096
218	Columbus	5426
219	Dayton	5341
220	Ironton	4636
221	Lima	6051
222	Sandusky	5998
223	Toledo	6107

OKLAHOMA

224	Ardmore	2374
225	Guthrie	3388
226	Oklahoma City	3827
227	Tulsa	3497

OREGON

228	Doraville	5527
229	Eugene	5588
230	Marshfield	4989
231	Pendleton	5148
232	Portland	4449
233	Salem	4629

PENNSYLVANIA

234	Altoona	6115
235	Clearfield	5994
236	Harrisburg	5529
237	Huntington	5771
238	Lancaster	5508
239	New Castle	5932
240	Philadelphia	4950
241	Pittsburgh	5327
242	Reading	5487
243	Scranton	6197
244	York	5423

RHODE ISLAND

245	Block Island	5803
246	Providence	6111

SOUTH CAROLINA

247	Aiken	2280
248	Charleston	1770
250	Florence	2493

SOUTH DAKOTA

251	Aberdeen	8709
252	Pierre	7213
253	Sioux Falls	7683
254	Yankton	7337

TENNESSEE

255	Chattanooga	3099
256	Jackson	3261
257	Johnson City	3950
258	Knoxville	3517
259	Nashville	3550
260	Perryville	3414

TEXAS

261	Abilene	2610
262	Amarillo	4655
263	Austin	1578
264	Brownsville	319
265	Corpus Christi	886
266	Dallas	2455
267	El Paso	1912
268	Galveston	1050
269	San Antonio	1362
270	Waco	1838

UTAH

271	Logan	6750
272	Manti	6826
273	Ogden	5848
274	Provo	6184
275	Salt Lake City	5358

VERMONT

276	Burlington	8123
277	St. Johnsbury	8176

VIRGINIA

278	Cape Henry	3478
279	Danville	3316
280	Lynchburg	3849
281	Richmond	3789
282	Roanoke	4164
283	Staunton	4535

WASHINGTON

284	Aberdeen	5825
285	Bellingham	5994
286	Everett	5480
287	Lind	5790
288	Seattle	5156
289	Spokane	6085
290	Tacoma	5218
291	Walla Walla	4694
292	Yakima	5540

WEST VIRGINIA

293	Charleston	3789
294	Elkins	5813
295	Huntington	4722
296	Parkersburg	4884
297	Wheeling	5214

WISCONSIN

298	Ashland	9066
299	Beloit	6938
300	Eau Claire	7978
301	Green Bay	8201
302	LaCrosse	7309
303	Madison	7251
304	Milwaukee	7366
305	Oshkosh	7508
306	Prentice	8765
307	Sheyboygan	7384
308	Wisconsin Rapids	8030

WYOMING

309	Cheyenne	7360
310	Cody	7769
311	Laramie	8814
312	Rawlins	8080
313	Sheridan	8118
314	Thermopolis	7489

CANADA

315	Victoria, B. C.	5777
316	Vancouver, B. C.	5976
317	Kamloop, B. C.	6724
318	Medicine Hat, Alb.	8152
319	QuAppelle, Sask.	11261
320	Winnipeg, Man.	11166
321	Port Arthur, Ont.	10803
322	Toronto, Ont.	7732
323	Montreal, Que.	8705
324	Quebec, Que.	8628
325	Frederickton, N.B.	9099
326	Yarmouth, N. S.	7694
327	Charlottetown, P.E.I.	8485

House-Humidifying Requirements

Difficulties Encountered in Humidity Control in the Average Residence and Methods for Remedying Unduly Dry Air Conditions.

ONE of the problems before the heating and ventilating engineers, which so far appears to be far from unsolved, is the humidification of residences. As was brought out by Professor Philip Drinker of the Department of Ventilation and Illumination in the Harvard School of Public Health, in a recent article on the subject, published in the *American Journal of Public Health* for August, the average householder must give some attention to temperature control in his residence, but he pays little heed to the control of moisture in the air. He may be aware that cold moderately dry outdoor air means excessively dry air within the house. Of this latter condition he may complain, but he usually does nothing to correct it.

In general, relative humidities of 40% to 60% will be found most conducive to comfort. To bring out the difficulties involved in humidifying a residence, Professor Drinker cites an example of a 3000 cu. ft. room with a maintained temperature of 70° F. The evaporation of approximately 14 oz. of water would give theoretically 25% relative humidity; 28 oz. would give 50% relative humidity, and no further evaporation would be necessary to maintain either condition. Dwellings are not, however, air-tight, and their contents absorb large quantities of water from the air; therefore, humidity requirements should not be calculated solely on the basis of the cubic contents of the dwelling.

MOISTURE ABSORBED BY HOUSEHOLD FURNISHINGS

In Fig. 1 are given approximate humidity equilibria curves, adapted from

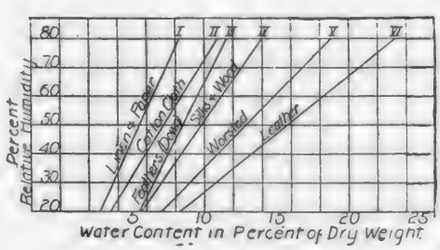


Fig. 1. Approximate Humidity Equilibria of Common Substances

the data of Wilson and Fuwa.* For our purposes, states Professor Drinker, it is sufficient to include only the regions of 20% to 80% relative humidity and to draw their curves as straight lines, although the originals are skewed in the regions 0% to 20%, and 80% to 100% relative humidity.

In increasing the humidity of a dwelling from 20% to 40%, it is evident that 500 lbs. of furnishings, represented by the curve for silks and woodwork (curve 4), would absorb approximately $500 \times (0.084—0.056) = 14$ lbs. of water before equilibrium would be reached.

Fig. 2. Air-o-mist Humidifier a Centrifugal Atomizer

Obviously, household furnishings, to say nothing of plants, take up water in large amounts, and, if deprived of this moisture, many of them are damaged.

This is taken into account in museums, art galleries, greenhouses, and, above all, it is recognized by an ever increasing list of manufacturing industries, where humidity control is even more important than the control of temperature. In all such cases, it is necessary to make very substantial allowances for moisture absorption by the contents of the room until humidity equilibrium with the room air is reached. Otherwise, in the competition for moisture it is a certainty that the furnishings will take practically all the moisture intended for the air.

A substantial difference in temperature between the indoor and outdoor air is, in itself, sufficient to promote leakage. If, in addition, a breeze of 15 to 25 miles an hour is blowing outdoors, and the walls and windows are exposed to it, the air in the room may undergo several changes an hour. During the cold months, in normal dwellings this rate of leakage varies from about 1 to 3 changes an hour, depending on the use of open fires and the velocity of the outdoor air.

CONDENSATION OF WATER ON COLD OBJECTS

No matter how the per cent relative humidity in any room is obtained, if the resulting atmosphere has a dew-point temperature (condensation temperature) above that of any object in the room, moisture will condense upon that object and it will drip.

With double windows and an indoor temperature of 69° F., Kratz finds that a relative humidity of 60% may be maintained with an outdoor temperature as low as 20° F., and dripping avoided. With single windows, dripping begins at about 30% relative humidity indoors and an outdoor temperature of 20° F.

FUEL CONSUMPTION

Because humidification permits the use of somewhat lower dry-bulb temperatures than would be found comfortable in normal air of lower humidity, it must not be inferred that fuel economy results.

If the outdoor air is 20° F. and the relative humidity 60%, for comfortable indoor conditions the cold air must be warmed to about 74° F.* unless moisture is added. This requires 13 B.T.U. per pound of air. The other alternative is to warm the air to 69½° F. and increase the relative humidity to 50%, for which a total of 18.5 B.T.U. is required—an increase of 37%. The difference is due to the large amount of heat required to evaporate water (the latent heat of evaporation) as compared with the heat needed to warm the air when no moisture has been added.

In this example, we have ignored air leakage and moisture absorption by the

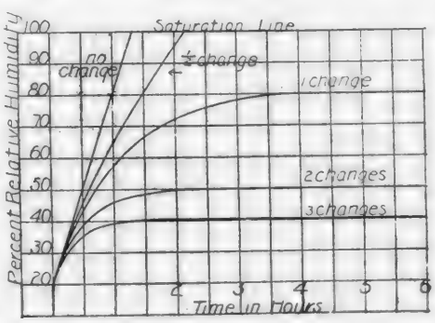


Fig. 3. Evaporation Curves of Air-o-mist Humidifier for 5000-Ft. Room, with Various Air Changes and Constant Temperature of 70° F.

contents of the residence, both of which would increase the amount of heat required for humidification. On the other hand, an outdoor temperature of 20° F. is probably low for mean outdoor conditions. The accuracy of this estimate, viz., 37%, will depend, then, very largely on local conditions.

METHODS OF HUMIDIFICATION

Among the handicaps with which we

* Wilson, R. E., and Fuwa, T. Humidity Equilibrium of Various Common Substances. *J. Ind. Eng. Chem.*, 14, 913, 1922.

* The resulting relative humidity will be about 9%.

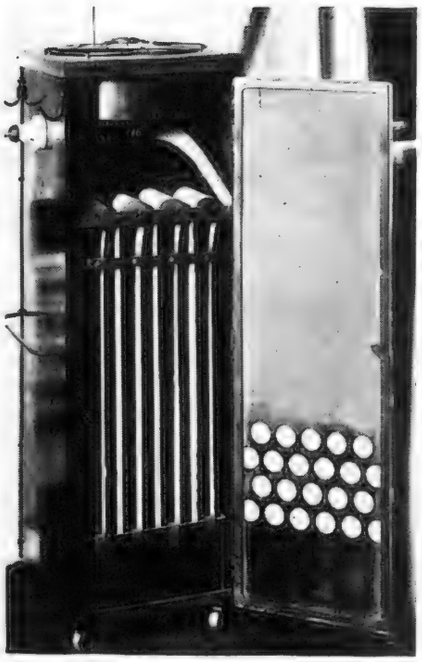


Fig. 4. Inside Arrangement of Sjostrom Atmospheric Normalizer

are confronted in considering methods for humidifying residences are:

(a) Noisy mechanical devices, regardless of their efficiency, will not be tolerated.

(b) Complicated or expensive devices will not be considered.

(c) The air leakage amounts to from ½ to 3 changes an hour.

(d) If the contents of the room, and the walls, floors, and ceilings become dried out and humidification is then attempted, they will absorb moisture in large amounts.

Professor Drinker speaks of meeting enthusiasts to whom objections (a) and (b) do not apply, and others who either did not believe or chose to disregard objections (c) and (d).

In industrial installations where humidification is of prime necessity, items (a) and (b), he adds, carry little weight, and ample allowance is always made for (c) and (d).

In residences, all four items are important. This, unfortunately, reduces the possibilities to very narrow limits.

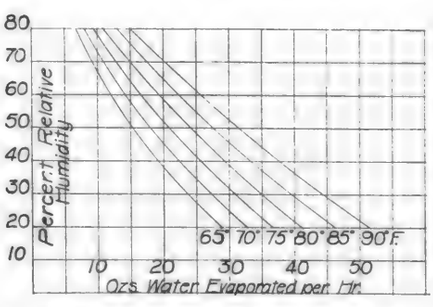


Fig. 6. Evaporation Curve of the Sjostrom Normalizer, Showing Changes in Evaporative Capacity with Variations in Relative Humidity

NEW TYPES OF HOUSE HUMIDIFIERS

Included in Dr. Drinker's article are descriptions of two recently-developed house humidifiers, one of the spray type and the other of the centrifugal type. Both of these devices send atomized water into the air at constant rates, one by spraying and the other by breaking up water into a fine mist. Either device can be turned on and off by thermostats, set for any desired wet-bulb temperature. When running, they send out mist at a constant rate, regardless of humidity conditions in the room.

Fig. 2 illustrates a small adaptation of the centrifugal humidifier principle and is designed especially for use in residences. Fig. 3 shows the performance of this machine in a 3,000 cu. ft. room subjected to various rates of leakage. From the curves, it appears that saturation of the air in a room of this size can be produced quickly by this machine. Actually, this is prevented by leakage and the hygroscopicity (moisture absorbing tendency) of the contents of the room.

In residences, either sprays or centrifugal atomizers could be utilized. Neither device is noiseless, but both are well adapted to automatic control. Their objectionable feature as a class is that moisture is emitted in the liquid and not the gaseous or vapor state, and dripping may occur.

SJOSTROM'S NORMALIZER

An efficient mechanical device embodying the wet towel principle is shown both open and closed in Fig. 4. Instead of towels, cloth belts are used and drawn continually through a trough of water by the motor which drives the fan at the top of the normalizer. The evaporative performance of this device is illustrated by the curves in Fig. 5, which show that moisture is evaporated at a rate governed by the temperature and relative humidity in the room, and therefore no thermostatic control is necessary.

The 70° F. curve was determined experimentally by finding the actual evaporation rate at various humidities. Since this rate is a function of the vapor pressure at wet-bulb temperatures, the other curves could be calculated by referring to the 70° curve. After the curves were drawn, points were chosen at random and checked experimentally, giving results sufficiently accurate for the purposes intended.

The curves in Fig. 6 give the humidity control effected by this machine in a 3,000 cu. ft. room heated to 70° F. They show that, theoretically, with no air leakage, saturation is approached asymptotically with infinite time. Practically, therefore, the automatic decrease of evaporative power with increase in per cent relative humidity, prevents the saturation of the air. Moreover, evaporation takes place by a film effect and no spraying or dripping results.

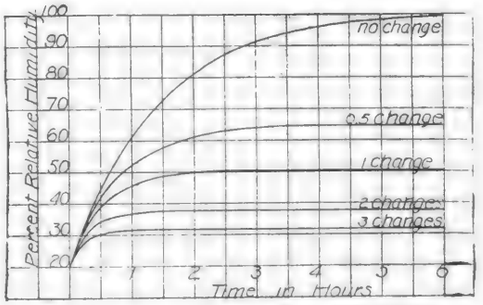


Fig. 7. Evaporation Curve of the Sjostrom Normalizer in 3000-Cu. Ft. Room with Various Air Changes and Constant Temperature of 70° F.

Organization of the Cooling and Air Conditioning Corporation

Announcement is made of the merging of the air conditioning business of W. L. Fleisher & Co., Inc., New York, with the air conditioning interests of the J. O. Ross Engineering Corporation, also of New York, and the air conditioning interests of the B. F. Sturtevant Co., Hyde Park, Boston, for the intensive development of the cooling and air conditioning field. The new company will be known as the Cooling and Air Conditioning Corporation, with headquarters at 31 Union Square, New York. The

Fig. 5. Sjostrom Atmospheric Normalizer in Operating Position.

officers are: President, J. O. Ross; vice-presidents, W. L. Fleisher and C. D. Park; secretary-treasurer, C. A. Secor.

All of the Fleisher-Sturtevant and Ross air conditioning systems and patents in these particular fields are included in the merger. The active management and engineering of the new company are in the hands of the same men who have carried on the work in this line for the separate companies. C. D. Park, who has joined the executive forces of the corporation, was for many years connected with the Parks-Cramer Corporation, specialists in industrial air conditioning work.

The new corporation will maintain offices and agencies in practically all of the principal cities of the country and is prepared, it is announced, to design and install cooling and air conditioning plants of any size or character in any part of the world..

Computing Roof Losses

H. C. Russell's formula for computing heat losses through roofs, which appeared in THE HEATING AND VENTILATING MAGAZINE for July, recalls the rule offered by T. W. Reynolds, published in these columns some ten years back, which applies particularly to heat losses from a heated to an unheated room. Mr. Reynolds illustrated his rule with a typical example, as follows:

A room heated to 70° F. is adjacent to an unheated room having a total loss in heat units to the outside air of 200 B.T.U. per degree of temperature difference. When the temperature of the outside air is at zero, what will be the resulting temperature of the unheated room caused by heat entering from the heated room which amounts to a total of 400 B.T.U. per degree of temperature difference between the two rooms?

X — 0 °= temperature difference between the unheated room and the air outside.

70°—X= temperature difference between the two rooms.

Equating the two, $200\ X = 400\ (70 - X)$

$200\ X = 28{,}000 - 400\ X$

$X = 140 - 2\ X$

$3\ X = 140$

$X = 46\ 2/3°$ F., the temperature of the unheated room.

New Uses for the Basement With Oil Burning

How attractive the basement quarters of a home can be made, where the house heater is equipped with an automatic oil-heating service, is demonstrated in the American Nokol Company's exhibit, in conjunction with that of the Brunswick-Balke-Collender Company, at the recent National House Furnishing Exposition in Chicago. The exhibit showed a room containing a heating plant, water heater and billiard table. The heating equipment consisted of a standard Nokol burner installed in the new American Radiator Company's oil burning boiler. A Premier water heater of the Crane make, equipped with a small Nokol burner, especially designed for hot water service and bungalow heating, was also featured. The billiard table was located only a few feet from the main heater.

Possibilities in the Use of Basements with Oil-Burning Heaters

Reorganization of the Bishop & Babcock Company

Announcement is made that a new corporation, doing business under the name of The Bishop & Babcock Manufacturing Company, of Cleveland, O., has been organized to take over the business of the Bishop & Babcock Company, of that city. The reorganization has been effected by A. G. Bean, president of the General Phonograph Company, in association with Walter White, president of the White Motor Company, and Walter Teagle, president of the Standard Oil Company of New Jersey. The new company, it is added, has ample financial resources and plans vigorously to develop and extend the business heretofore conducted by The Bishop & Babcock Company. Practically the entire personnel of the former organization will be retained under the new management, but this organization will be strengthened by additions.

For 46 years The Bishop & Babcock Company has been in business. As reorganized under the name of The Bishop & Babcock Manufacturing Company, the concern owns and operates two large factories in Cleveland, which are equipped with modern appliances and facilities for high-quality production. It also owns and operates the Cleveland Tack Works, the Cleveland Faucet Company and the Massachusetts Blower Company, of Watertown, Mass. While the company's line includes soda water fountains, carbonators, bottle-filling machinery and beer-drawing apparatus, it is widely known as the manufacturer of vacuum heating specialties, ventilating and temperature-control systems. The company maintains branch offices in the principal cities throughout the country.

Heating and Piping Contractors' National Association

Recent Committee Appointments

The personnel of the Boiler Output Committee of the Heating and Piping Contractors' National Association, it is announced, is made up of George M. Getschow, Chicago, chairman; W. L. Fleisher, New York; Harry M. Hart, Chicago; Charles G. Lamb, Chicago; and Frank A. Merrill, Boston. The boiler formula and test charts have been printed and were to be in the hands of the boiler manufacturers before the end of August. As soon as the results of tests are received from the boiler manufacturers, they will be distributed to the members.

For the Committee on Standardization, President Merrill has reappointed Robert C. Morgan, of Philadelphia, and S. Austin Pope, of Chicago, to serve three more years with Walter S. Fleisher, of New York, who will continue as chairman. Included in the committee's plans for this year is the extension of the Engineering Standards, a study of Standard Conditions to Accompany Proposals, and a survey of the members to discover how many are using the Engineering Standards. Already the data for Standard Radiation Estimating Tables for three more cities have been completed, namely, Eastport, Me.; Portland, Ore.; and San Antonio, Texas.

New Apparatus and Appliances

The Cokal Combustikator

A novel idea for aiding combustion in a coal-fired boiler is embodied in the Cokal Combustikator, which has been placed on the market by the Cokal Stoker Corporation, 341-349 East Ohio St., Chicago, Ill. It consists of an inside refractory hopper, a special type of inclined balanced intermeshing stoker cars with operating mechanism, and an ash dump plate with operating mechanism. With this arrangement coal is thrown through the firing door against the wall of the coking chamber or arch. It gradually spreads and piles up on the front of the stoker as more coal is thrown against the coking chamber wall. When the stoking lever is pulled the coal moves downward toward the coking zone.

Every time the stoking lever is pulled the fuel is moved still further forward over the fuel bed until burned. The ash is dumped by releasing the ash-discharge lever, leaving a space at the bottom of the inclined grate to receive the ash.

The advantages of this arrangement, it is pointed out, are that no inrush of cold air can occur every time the firing door is opened since the coke bank keeps the passage through the furnace closed, that no hand cleaning of the fires is required, that it is possible to burn the volatile completely without smoke after preheating, that the green coal is carbonized to coke, and that the intermeshing bars keep the fuel bed broken up and free from holes.

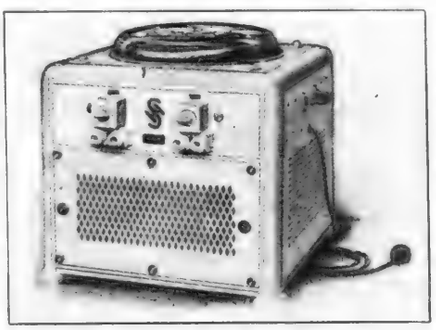
The Combustikator, it will be noticed, is self-contained inside the boiler furnace, except for two operating levers. It can be installed, the manufacturers state, in any fire-box type of boiler from 40 H.P. up, and can be used in all standard boilers.

Typical Installation of Cokal Combustikator in Fire-Box Boiler Where Water-Cooled Side Walls of Fire-Box have Been Lowered to Suit the Added Unit

A Unit Ozonizer

Highly successful tests, it is reported, have been conducted in Germany recently with high ozone concentration for the treatment of respiratory diseases, such as asthma and pulmonary diseases. In the treatment of these ailments the air is ozonized and turpentine is evaporated into the air, together with a little Eucalyptus oil. The compound of turpentine and ozone is visible as a fine vapor and is essential for the healing effect. The treatment is not longer than an hour at a time.

The portable unit ozonizer used by the institute of Dr. Jackel in Berlin, where the tests mentioned were conducted, is manufactured by Siemans & Halske, in Germany. As shown in the accompanying illustration it contains the ozone apparatus, the electric high-tension transformer and a transformer from D. C. to A. C., in case direct current has to be used. The unit is ready for connection

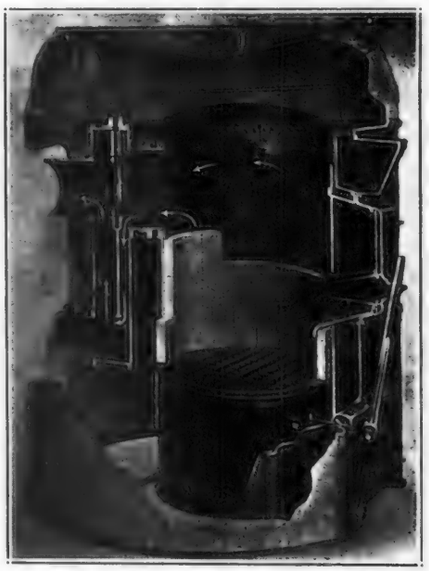


New German Type of Unit Ozonizer

to the ordinary lighting system. (*Abstracted from Gesundheits-Ingenieur for July* 11, 1925.)

A Steel Warm-Air Furnace

The trend toward better warm-air furnace construction is to be noted in the design of the Armstrong steel furnace which has been placed on the



Design of the Armstrong Steel Warm-Air Furnace

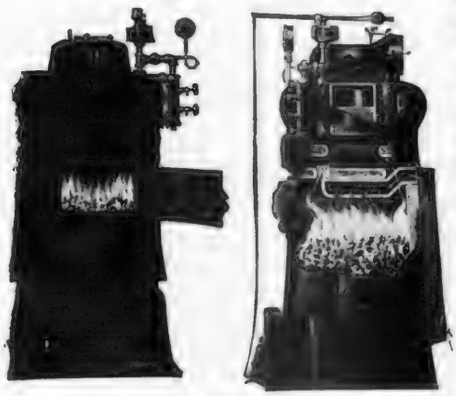
market by The Thomas & Armstrong Co., London, O. In addition to the fact that steel radiates heat much more rapidly than cast-iron, the Armstrong construction, it is pointed out, includes a lining of fire brick for withstanding high temperatures. The heater is cold-riveted or welded, obviating the use of cement-filled joints. In using oil or gas with this heater, attention is called to the baffled fire travel provided in this design which serves as a protection against strong down-draft winds in the chimney. The furnace is equipped with a "carburetor" on the feed door. This is connected to the draft-damper chain in such a way that when the draft damper is pulled open, the chain also opens the carburetor door, thus admitting a stream of air into the furnace just above the coal bed. An upright shaking lever is another feature of this heater. A special type of grate bars is provided, adapted to burning any kind of coal or wood. The grate bars operate with a rocking motion.

For those desiring gas burners, the company supplies two burners of the Scientific type which enter the sides of the furnace just above the fire-brick. This leaves the entire depth of the fire-pot free for using coal, an arrangement which permits the use of gas only on mild days and coal in severer weather.

A New Round Smokeless Boiler

A round boiler designed to burn any kind of bituminous coal smokelessly, is a new product recently placed upon the market by the Richardson & Boynton

Company, New York. The boiler is built with a unique, hot-air blast attachment for admitting the proper amount of super-heated air over the fire. The air is admitted through a channel in the form of a cast-iron box at the back of



Construction Features of the New Richardson Round Smokeless Boiler

the boiler. It is injected downward through a water section, at a point directly over the ignited bed or surface of the fire. Exhaustive tests made by the company, indicate the efficiency of this arrangement.

New Large-Capacity Coil Heaters

Increased capacity in a coil heater is furnished in the Triple Coil Excelso heater which has been added to the line of the Excelso Specialty Works, Buffalo, N. Y. It is built along the same general lines of the smaller-size Excelso heaters. In employing a triple coil the length of the heater has been reduced, an important factor where space is limited. In addition, as the manufacturers point out, there are many low-water line types of boilers in which a triple-coil heater can be used to special advantage.

Two sizes are furnished, the capacities in heating water below the water line being 600 and 800 gal., respectively. When heating water with live steam above the water-line, figured on a temperature rise of 100° in 3 hrs. at 3 lbs. to 5 lbs. pressure, the one coil heater (No. 35) has a capacity of 900 gal. and the other (No. 36) 1200 gal. These capacities, it will be noted, meet the requirements of practically any size tank installation used for domestic service.

Another use for these large-type heaters is for warming garages with hot water. For this use, the heaters are attached to steam boilers and hot water lines are led from the coil heater to the garage. The heaters may also be used for preheating oil for large burner installations or, when attached to steam or vapor boilers on an oil-burning system, they can be made to serve during the summer time for heating water for domestic supply if the oil burner is operated during the morning or evening and controlled by a thermostat.

New Motor-Driven Centrifugal Pump

A new motor-driven centrifugal pump, for use in connection with heating systems, has been placed on the market by the M. J. Finn Pump Mfg. Co., Pittsburgh, Pa. It is of the return-line type, with a capacity of between 4000 and 7000 sq. ft., depending upon the size.

The design is notable for its simplicity, comprising a bronze centrifugal pump with a bronze impeller. This impeller consists of a wheel revolving inside the pump case. As it revolves it touches only the water, and does not touch or rub against any metal part. With this construction, it is estimated, 32 possible parts are eliminated, such as gears, pulleys, buckets, belts and pump valves.

New Motor-Driven Return-Line Centrifugal Pump

In addition to the use stated, the pump may be applied to water supply, refrigeration work and water circulation generally. It is driven by a Westinghouse ½-H.P. motor direct-connected through a flexible coupling.

A distinctive feature of the pump is that either opening may be used as the outlet or inlet by reversing the motor. In addition, it is impossible to overload the pump since the capacity remains nearly constant regardless of the load.

Automatic Stoker for Cast-Iron or Steel Heating Boilers

Features of the design of the Midget stoker, the new appliance being marketed by the Yarwood Heating Service, Inc., Buffalo, N. Y., designed for use with any type of cast-iron or steel boiler, first described in THE HEATING AND VENTILATING MAGAZINE for July, are brought out in the accompanying illustration. As will be noted, this machine is intended to operate as an automatic stoker. This is accomplished by means of a housing containing special paddles and agitators for spraying the coal which it receives from the magazine over the fire grate.

The stoker is driven by a small motor which can be connected to any light socket. For the supply of additional air under the grate or ashpit, when small-sized coal is being burned, a fan is placed immediately behind the stoker. A pipe leads from this fan and discharges air through a special ashpit door which is furnished with the machine. In this way, it is stated, sufficient draft is created to burn any size of fuel less than ½ in. in diameter, either soft or hard.

The magazine provided with the stoker has a capacity of from 300 to 500 lbs. The flow of coal can be regulated at three different points: first the gate leading from the magazine to the stoker may be opened or closed to any degree to regulate the flow of coal into the stoker; second, on the side of the stoker a regulator valve controls the amount of coal being fed to the fire; third, there is an automatic switch which is placed in the boiler and wired to the electric outlet used for plug connection. This electric switch is arranged to start and stop the stoker as the steam rises and falls in the boiler. By setting the switch at a predetermined point, it is possible to maintain the steam pressure in the system at the designated point.

The whole machine is built into a frame which is portable, being mounted

Automatic Stoker for House Heaters

on casters. When placed in operation, it is first rolled into the coal bin and filled with coal. It is then returned to the boiler and placed in position so that the discharge pipe enters the draft door. The stoker will then be in line with the special fire-door and is ready to feed coal to the fire. As the steam pressure rises in the boiler, the automatic switch breaks the circuit and the stoker will lie idle until more coal is required. This operation continues until the magazine is empty, which, as a rule, will mean 8 to 10 hours. The machine is described as very effective for night firing or for handling boilers where the janitors have other work to do besides taking care of the heating plant.

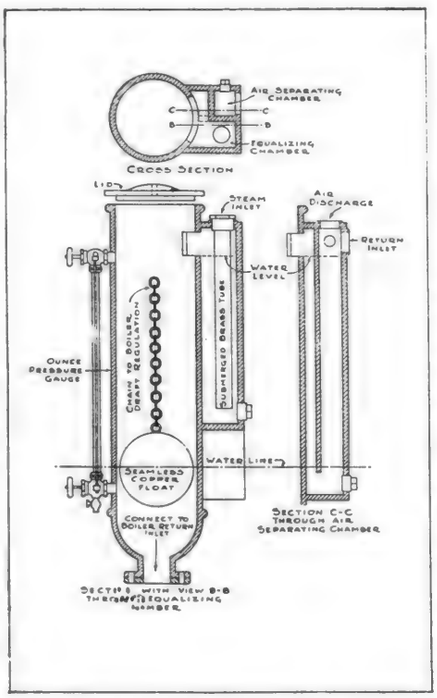
The fan used is of the American Blower Company make. Electric switches are furnished by the American Radiator Company and the Monitor Controller Company. The motors are of Wagner Electric and Century Electric make.

New Trade Publications

A. E. F. Welding Illustrated is the title of a new periodical issued by the American Electric Fusion Corporation, 2610-2620 Diversey Ave., Chicago, Ill., manufacturers of electrical apparatus for heating, welding and fusing. The company states that each issue will contain something worth while to those interested in electric welding. The initial number has some pertinent remarks to make regarding the principle of electric spark, butt and seam welding.

Trane Data for figuring radiation, pipe sizes and boiler connections for Trane vapor and vacuum heating systems, are contained in Bulletin 11, dated August, 1925, issued by the Trane Co., La Crosse, Wis. Much information is concisely arranged in this bulletin and it gives an indication of the engineering service which manufacturers are offering in connection with their products.

Veco System of Vapor Heating, recently placed on the market by the Vapor Engineering Co., 489 Fifth Avenue, New York, is the subject of a descriptive catalogue just issued by the company. The Veco system is of the "open to the atmosphere" type, that is, no vacuum apparatus is required on the return piping to induce circulation and no pressure is required in the boiler to force heat to the radiators. Circulation is induced by a natural suction on the return piping which is obtained without mechanical apparatus. The boiler draft-regulating apparatus is designed to operate at a pressure ranging from 1 to 6 oz., and this apparatus is provided with an equalizing feature to prevent the pressure from going over 10 oz. at any time.

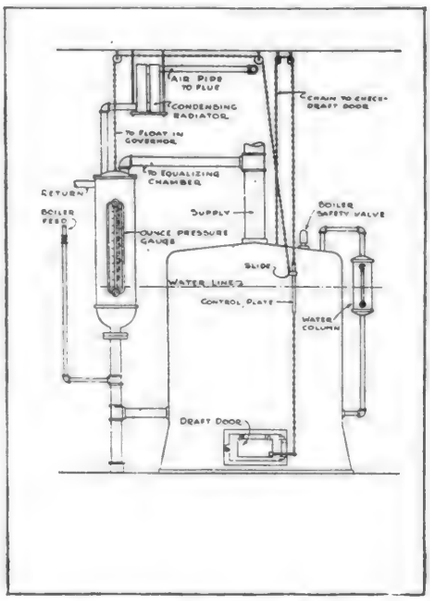


Construction Features of Veco Governor

Veco Return Trap With Movable Elbow

The specialties used with this system include the Veco governor which is set up at the side of the boiler in the basement with the water-line on the governor even with the water-line of the boiler. The main body of the governor is open to the atmosphere at the top and at the bottom is directly connected, without any check valve, to the boiler below its water-line.

A copper ball float in the governor is connected by means of chains to the boiler draft and check doors in such a way that the movement of the water level in the governor, caused by the increase or decrease in the boiler pressure, operates the draft and check doors of the boiler. By means of an adjusting plate on the chain leading to the draft door of the boiler, the governor can be set to close the boiler draft at any desired pressure between 1 and 6 oz.



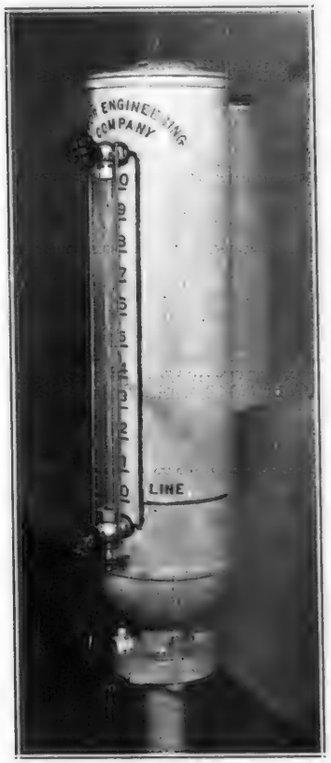
Installation at Boiler of Veco System

The return pipe, carrying air and condensation from the radiators, is connected to an air-separating chamber on the back of the governor. From this chamber the water is discharged into the governor and returns to the boiler, while the air is carried off through the connection on the top of the separating chamber through an air pipe which enters the boiler flue.

A direct connection either from the boiler or from the supply main is made to the safety valve and equalizing chamber, which is also on the back of the governor. This chamber is constructed in connection with the air-separating chamber so as to provide an equalizing device for liberating steam, at 10 oz. pressure, through a submerged brass tube, and in this way equalizing the pressure, preventing the pressure from rising above 10 oz., and preventing the water in the governor from overflowing at the top.

The supply valves used with the Veco system have a rising worm movement, with Jenkins discs, while the Veco return traps are of the water-sealed type without movable parts, designed to discharge the water of condensation from the radiator without permitting the pas-

sage of vapor. There is a small vent opening, however, in the interior of the trap to free the radiator of air and to cause sufficient suction in the radiator to insure the introduction of vapor for heating purposes.



Veco Governor Showing Gauge Glass and Pressure Indicator up to 10 oz.

The trap is constructed with a movable elbow feature at its outlet, permitting right and left return piping connections to it, as well as direct upright connections. The top of the trap is provided with a test plug for testing the air suction. For unusual requirements the company is prepared to furnish thermostatic return traps.

The catalogue concludes with directions for connecting the draft regulation and operating suggestions. Size 5 x 7 in. Pp. 16.

No Expansion Tank entitles a little booklet from the Mueller Co., Decatur, Ill., devoted to the Mueller system of hot water heat control. This describes the successive steps that have made it possible to do away with the open-tank system, and the closed tank scheme, through the combination of a water reducing valve and a relief valve, especially designed for this purpose. The publication contains all necessary information regarding the system. Size 3½ x 6 in. Pp. 16.

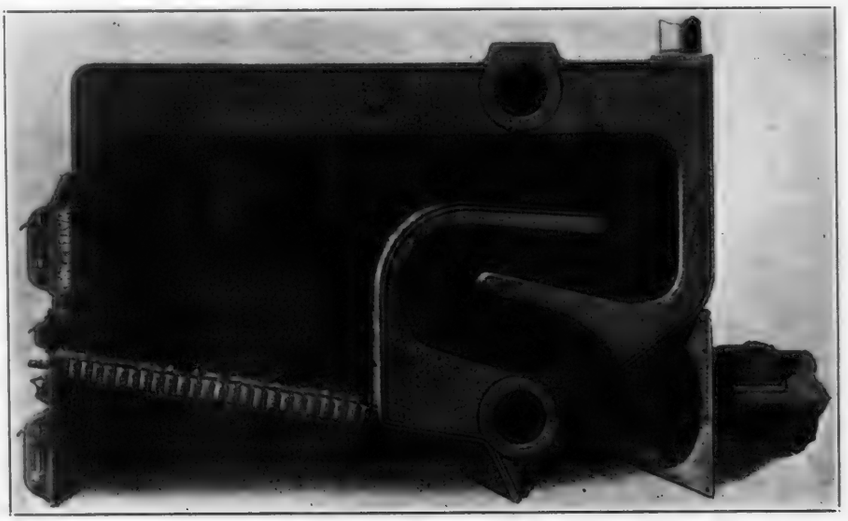
Victor Temperature Regulators are described and listed in Bulletin No. 6, issued by the Atlas Valve Co., Newark, N. J. These regulators for water heaters, storage tanks, cooking vats, retort ovens, etc., were developed over thirty years ago, and have been manufactured since that time, with such refinements as to bring them closer to perfection. The Victor regulator is guaranteed to operate its steam control valve on a variation of 2°. The bulletin is replete with illustrations showing the applications of this regulator. Size 6 x 9 in. Pp. 20.

Newport Automatic Feed Boiler or, as a sub-title on the title-page has it, "The Practice of Scientific Heating as Developed in the Newport Boiler," is the subject of a well-compiled catalogue, issued by the Newport Boiler Co., Chicago, Ill. The principal attributes of this boiler—convenience, economy, uniform heat, and adaptability to different sizes and kinds of fuel—are taken up seriatum. The 100% over-sized ash-pit and the Newport ash-spray being the convenience feature, the magazine-feed being the economy feature, the automatic feeding giving the uniform heat feature, and the adjustable throat giving the adaptability feature. In addition, twenty-one specific features of Newport design and construction are taken up and discussed in order, including maximum heating surface, flues that prevent heat loss through chimney, ease of cleaning, rapid circulation in water ways, low steady water-line, low return inlet, air-cooled center grate rest, double capacity magazine, simple two-piece grates, combined side grate and connecting bar, and half of boiler usable at a time. The catalogue concludes with ratings and measurements for both the double-grate and single-grate types. Size 8½ by 11 in. Pp. 30.

Bernhard Triple Combustion Boilers, as manufactured by the Bernhard Boiler Mfg. Company, 3161 East 61st St., Cleveland, O., are featured in newly-issued circular matter. This boiler, which is the latest design of J. B. Bernhard, president of the company, is remarkable for its low water-line, its short grate, and the ease with which it may be erected. The point is emphasized by the manufacturers that the combustion from each grate bar is taken care of in the section directly above it, serving to maintain the same ratio of grate surface, fire surface and flue area. For instance, the area through the flues in sections is: For 4-ft. grate surface, 70 in.; for 6-ft. grate surface, 90 in.; for 12-in. grate surface, 180 in.; for 18-in. ft. grate surface, 270 in.; for 21-in. grate surface, 315 in.; and for 32-ft. grate surface, 485 in.

Hartmann Adjustable Radiator Brackets, manufactured by the Charles Hartmann Co., 981-991 Dean St., Brooklyn, N. Y., are featured in a recently issued circular which gives, in handy form, the necessary dimensions and other data for use with wall radiators and 1-col., 2-col. and 3-col. radiators. The brackets are described as adjustable both up and down and in and out from the wall, permitting of pitching or leveling the radiator and for quick adjustment to care for any irregularity in the wall surface. They are fastened directly to the wall with expansion bolts or lag screws.

Beginneering Data Sheets for Harrisburg Star Low-Pressure Heating Boilers comprise the 1925 catalogue, just published, of the Harrisburg Star Boiler Corporation, 15 Park Row, New York. These boilers, which are built according to the A. S. M. E. Code for low-pressure heating boilers, are of the self-contained, internally-fired, water-tube type, with inner and outer shells forming a water jacket completely surrounding the fire and gases. The rated capacities given are those obtained when operating at 2 lbs. pressure. The data sheets cover the company's line of



Bernhard Triple-Combustion Boiler

direct-draft low-pressure boilers ranging from 3450 to 42,000 sq. ft. steam radiation capacity, embracing 22 sizes, with full dimensions for each size; down-draft low-pressure heating boilers in 22 sizes, with dimensional data of a typical down-draft boiler of 20,700 sq. ft. capacity; a high-pressure type designed for 160 lbs. working pressure; and a twin type. Size 9 x 11¼ in. Bound loose-leaf, 39 sheets.

WING-TYPE E. M. BLOWER, for burning small anthracite, screenings and slack, are discussed in a timely circular, received from the L. J. Wing Mfg. Co., New York. The illustrations show the blowers attached to different types of boilers, indicating their wide applicability. One installation, for instance, is in a New York apartment house, with the blower connected directly into the rear end of a cast-iron water boiler. Another illustration shows two cast-iron sectional boilers in a school in northern New Jersey equipped with Type E. M. blowers. As against the cost of the blower equipment for all of the schools, in this particular town, amounting to $14,500, the saving through the burning of small-sized anthracite, it is stated, was $19,500 in one year. These blowers are usually furnished with regulators for controlling the speed, thus making it possible to adjust the air supply to the requirements of the particular boiler, condition of fire, kind of coal, etc. Size 8½ x 11 in. Pp. 4.

INTERNATIONAL ECONOMY SMOKELESS BOILERS are presented in a comprehensive catalogue, issued by the International Heater Company, Utica, N. Y. As this boiler is one of the few that does not contain a special air inlet admitting air over the fire-bed, special interest attaches to the method adopted for securing smokeless combustion. To accomplish this a wing wall construction is so designed that the gases are forced to change from a horizontal to a vertical plane, and thence back to a horizontal plane before they leave the secondary combustion chamber. A bridge wall at the end of the fire box has horizontal openings near the crown sheet, through which the smoke and gases pass into the primary combustion chamber. This provides the vertical plane. A vertical plane made of the brick wing wall in the secondary combustion chamber provides the second change of plane before the gases reach the flue passages. Incidentally, the brick wing wall becomes heated to incandescence, and serves to maintain a high temperature of the gases. This, coupled with the swirling motion of the gases, given by the reversal of the planes, is used to accomplish a thorough mixing of the flames with the combustible gases, and the air admitted over the fire. Other distinctive construction features are given, and are supplemented with a striking double-page cutaway view in colors of the boiler, showing the circulation of gases, bridge wall, brick wing wall and primary and secondary combustion chambers. Some twenty odd pages are devoted to illustrations of buildings, equipped with boilers of this type. Size 7½ x 10¾ in. pages 40.

BURNHAM WATER-TUBE TYPE BOILER, for high-pressure water heating, is the subject of a circular, issued by the Burnham Boiler Corporation, Irvington, N. Y. This heater is designed for working pressure of 80 lbs., and is listed in seven sizes, from 1000-2800 sq. ft. water rating, with tanks of 865-1760-gal. capacity. The design follows the regular Burnham practice, with a three-fold fire travel. Regulation is at the rear, controlled by the temperature of the water. The bulletin gives all salient data, with drawings showing proper tank installation.

Sections of the International Economy Smokeless Boiler Showing How Gases Are Forced From Horizontal to Vertical and Back to Horizontal Plane

HONECO AIR-OPERATED CONTROLLERS for automatic control of pressure, temperature, condensation, humidity, liquid levels, timing of processes, control of dampers, etc., are the subject of a new catalogue (No. 2500) issued by the American Schaeffer & Budenberg Corporation, Brooklyn, N. Y. This is described by the company as the most complete catalogue so far issued on air-operated controllers. In addition to the numerous illustrations of the controllers themselves, the catalogue contains fourteen typical installation diagrams, in blue print form. Honeco controllers, it will be recalled, were formerly manufactured by the Hohmann-Nelson Company, Eau Claire, Wis. Size 7¾ x 10¾ in. Pp. 2501-2564 (punched for binding).

AUTOMATIC CONTROL of temperature, pressure, humidity, liquid level, condensation, and other factors, is discussed in a new and revised edition of the catalogue of the C. J. Tagliabue Mfg. Co., 18 to 88 Thirty-third Street, Brooklyn, N. Y. In general the arrangement of the catalogue resembles that of preceding editions, but this edition is sixteen pages larger, making a total of 84 pages.

"ABC" STEEL-PLATE EXHAUST FANS, especially adapted for removing shavings, saw-dust, for conveying material and for the removal of smoke and fumes, are presented, with full data, in a new bulletin (No. 3506) issued by the American Blower Company, Detroit, Mich. The bulletin describes the fan in detail, views being shown of various types of fan wheels as used for different purposes. Size 8½ by 11 in. Pp. 28, supplemented by a dealers' pocket price book, dated June, 1925, covering the "ABC" line of electrically-driven fans and blowers for exhausting, blowing, drying and cooling.

INSTRUCTIONS FOR INSTALLATION OF ILG VENTILATING FANS is the subject of a useful manual published by the Ilg Electric Ventilating Co., 2850 North Crawford Ave., Chicago, Ill. Included in the contents are notes on correct and wrong methods, things to avoid, correct and wrong methods of using ducts in connection with propeller fans. This is followed by concise directions for installing ventilating fans in restaurants and hotel kitchens, banks, offices, garages, large halls, dance-halls, factories, theatres, and similar buildings. The remainder of the manual is devoted to data for figuring register sizes, together with data on furnace fans, blower installations, drying, sky-light installations, residence kitchens and cooling. Size 8½ by 10¾. Pp. 36.

FITZGIBBONS-ONTARIO STEEL BOILERS for homes are featured in a bulletin of the Fitzgibbons Boiler Co., New York. These boilers are of the horizontal fire-tube type, with deep fire-box and combustion chamber with a gas-diverting arch designed to accomplish a maximum utilization of the products of combustion. It is stated that the ratings under

which the boilers are listed represent the actual ability of the boilers in square feet of radiation plus allowance for piping and need not be added to in order to furnish given capacities.

"Educational Bureau" the New Name for the N.W.A.H. & V. Association's Publicity Department

With the appointment of L. Wayne Arny as Director of Public Relations for the National Warm-Air Heating and Ventilating Association, the association's Educational Publicity Committee announces that the new department will function as the "Educational Bureau" of the association.

A Standard Coal Buyers' Service

A unique type of service for the buyers of coal is offered by Wightman D. Roberts, member of the American Institute of Mining and Metallurgical Engineers, with offices at 910 Robson-Prichard Building, Huntington, W. Va. Associated with Mr. Roberts are F. R. Wadleigh, a former United States fuel administrator, and a combustion engineer, of New York; Charles E. Krebs, a geologist, of Charleston, W. Va.; and F. L. Schoew, an engineer and geologist of Huntington, W. Va.

The service includes an official analysis of any coal sold, the responsibility of any shipper, the location of any mine, and the character of the seam work, including addresses of officials of companies or selling agents, advice on the coal best adapted to users' needs, and costs of using it in dollars and cents per ton; costs of ash, moisture, sulphur, oxygen and ash fusion, together with cost per million B.T.U.

Inexhaustible Fuel Oil Supply From Vegetable Kingdom

Inexhaustible supplies of fuel oil from the vegetable kingdom was an interesting prophesy of Morgan J. Hammers of Chicago, delivered during an address before a group of dealers in oil-heating devices in Chicago recently.

According to Mr. Hammers, the burning of oil for heating purposes has been good business for the coal people on the ground that the distillation of oils from soft coal is developing rapidly, and the coal producers are selling to the oil refiners. Regarding the derivation of fuel oil from vegetable sources, Mr. Hammers told how the United States Department of Agriculture has been looking into the matter of deriving oils of the alcohol group from cane grown in tropical countries, and is authority for the statement that the supply from such sources may be considered inexhaustible.

Smoky Chimneys and Fuel Waste

A smoky chimney is not only a nuisance to the neighborhood, but is also a sure indication of fuel waste. The fact that house-heating types of boilers are now effectually burning soft coal without smoke is convincing evidence of the effectiveness of the Bunsen burner principle as applied to so many of the updraft types.

In a boiler such as the Utica Imperial super-smokeless, for instance, in which the required oxygen is introduced through the side to points above the fire-bed, observations of the effect of this arrangement show that the smoke is ignited into a bluish-white flame which travels through the flues of the boiler with a distinctive rotary motion. This, of course, aids in the transmission of heat to the boiler surfaces. Incidentally a more thorough combustion of the coal means less coal to handle and, consequently, a smaller quantity of ashes to remove.

New Publications

ARCHITECTURE AND ANTHRACITE is the title of a brochure issued by the Anthracite Coal Service, Philadelphia, compiled in collaboration with the Structural Service Bureau, of which D. Knickerbocker Boyd is architectural advisor and structural standardist. Included in the contents is the paper by Mr. Boyd on "Designing and Planning for Home Heating Economies," delivered before the A. S. H. & V. E., in Boston last January. An article on "The Chimney as an Object of Interest and Beauty," being the substance of an illustrated talk by Albert Kelsey before the Philadelphia Chapter of the A. S. H. & V. E.; C. A. Connell's paper on "Small-Size Anthracite Fuel and Equipment and Its Economical Utilization," presented at the A. S. H. & V. E. meeting in Boston last January. The remainder of the bulletin is taken up with the "Table of Flue Sizes and Chimney Heights" (reproduced in THE HEATING AND VENTILATING MAGAZINE for March, 1925), standard dimensions for rectangular and round fire-clay flue linings, concluding with a typical specification for brick chimneys, with fire-clay flue linings as recommended by the Eastern Clay Products Association. Size 8½ by 11 in. Pp. 20. Copies may be obtained from Anthracite Coal Service, 260 South Broad Street, Philadelphia.

STANDARDS OF THE HYDRAULIC SOCIETY, third edition, has been issued by the Hydraulic Society, whose headquarters are at 90 West Street, New York. The edition contains not only the information embraced in the earlier editions, but also much new and valuable data, including a standard classification of pumps, standard nomenclature and definitions pertaining to the industry, standard dimensions for cast-iron flanges and cast-iron flanged reducers, for 125 lbs. and 250 lbs. steam pressures, as adopted by the A.S.M.E. There is also a very complete list of chemicals and other special liquids, accompanied by specifications of the materials recommended for the construction of pumps for handling such liquids. Copies of the booklet are obtainable from the society upon application to C. H. Rohrbach, secretary, 80 West Street, New York.

DETERMINING PIPE SIZES FOR LOW-PRESSURE AND VACUUM STEAM-HEATING SYSTEMS (Bestimmung der Rohrweiten von Dampfleitungen, insbesondere von Niederdruck und Vacuum-Dampfleitungen). By Johann Schmitz, chief engineer for Koerting Bros. Ltd., Hanover-Linden, Germany, is a recent publication issued by R. Oldenbourg, Berlin. The use of charts for determining pipe sizes of heating systems is much more in vogue in Europe than in the United States. Those for high-pressure steam and for low-pressure steam of 1.4 lbs. per square inch (0.1 at.) are available with Rietchel's book on heating and ventilation and are based on the latest research work in the field. Charts or tables or any practical means for showing pipe sizes for vacuum systems or pipe sizes over 12 in. in diameter have not previously appeared in German publications. The present volume contains an explanation of the formula used in compiling the tables, followed by five tables covering local resistances, such as elbows, valves, fittings, etc., and thirteen tables for vacuum-heating systems, each for a different vacuum. Pp. 4. Tables 18. Price 4.20 marks. Size 13 x 10 in.

David Moffat Myers, consulting engineer, New York, formerly of Griggs & Myers, which has been dissolved by mutual consent, announces that he has opened offices in the Metropolitan Tower, at 1 Madison Avenue, New York, where he will continue his practice in the special field of economy in industrial power plants, involving all problems of design and operation. Among clients who have retained his services are the B. F. Goodrich Company, U. S. Metals Refining Company, American Chain Company, Midvale Steel Company, Thomas A. Edison Company, and Cuba Cane Sugar Company. Mr. Myers is a member of the A.S.M.E., serving on the executive committee of its Fuel Section. During the war he was advisory engineer to the U. S. Fuel Administration, having charge of a successful fuel conservation plan in the industries which he devised. Mr. Myers is also consulting engineer to the U. S. Bureau of Mines and is the author of three books and numerous technical papers on power plant design and operation.

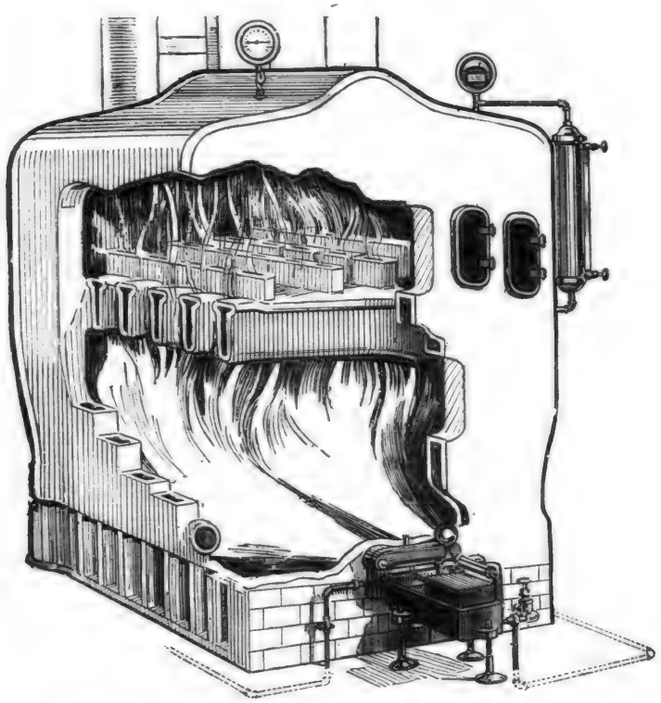
Present Accepted Practice in Domestic Oil Burners

6. **Caloroil.** *Atomizing, Gravity-Feed, Air-Blast Type.*

7. **Oil-O-Matic.** *Atomizing, Gravity Oil Feed to Metering Pump, Air-Blast Type.*

6.—Caloroil

The Caloroil burner is unique in that it does not share with any other its method of preparing oil for burning. It is manufactured by the Caloroil Burner Corporation, New York City, and is available for various-sized installations as it may be installed on a multiple-unit basis. The Caloroil is of the atomizing type, and is listed by the Underwriters to burn oil above 28° gravity A.P.I. A simple, yet effective modification of the ordinary dressing-table atomizer is used, and the design has been worked out to produce a very fine degree of atomization and a micrometric control.



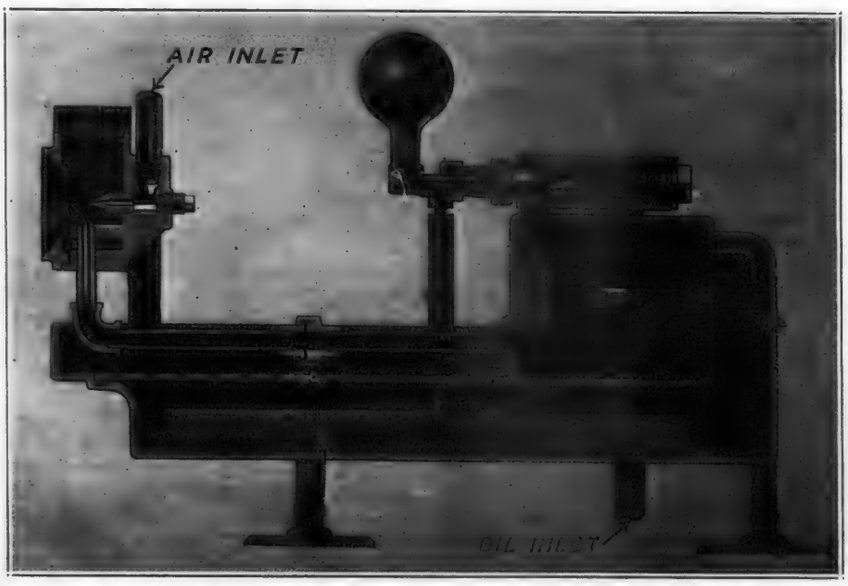
Caloroil Installation with Two-Nozzle Burner Unit

Two units are employed in each installation. The first consists of a motor, driving through a metal-reinforced leather belt, a slow-speed rotary air compressor, delivering air at 2 to 5 lbs. pressure, according to requirements. An air strainer and oil reclaimer is mounted upon the same base which contains oil for lubricating and oil-sealing the compressor. This unit is usually placed at one side of the boiler. The atomizing unit is set in front of the ash clean-out door, after the grate has been removed. This unit carries one or more atomizing nozzles and is so set that these nozzles project slightly through the door but do not protrude materially into the combustion chamber. A gas pilot is placed in proper relation to the atomizing nozzle, and is so arranged that it cannot be accidentally extinguished. Oil is fed by gravity to an oil reservoir below the atomizing unit, where it is maintained at a fixed level through a float mechanism which automatically actuates a feed valve. The oil-nozzle pipe extends down into this oil reservoir, and is capable of being moved vertically by a very fine adjusting screw and worm-gear. The oil-nozzle, itself, is so located that the blast of air through the air-nozzle passes over its lip, creating a suction which sucks the oil from the level in the reservoir and atomizes it in a conical spray. Air is supplied to the air nozzle, from the compressor, at a pressure of from 2 to 5 lbs.

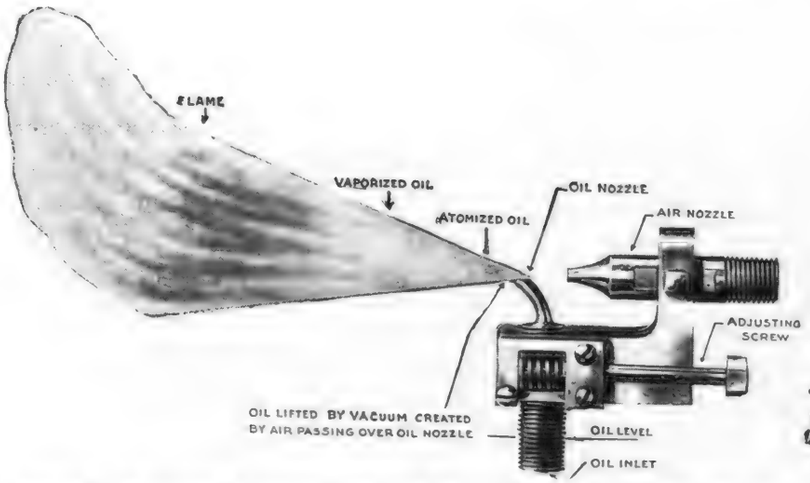
In heating systems where a boiler pressure exceeding 7 lbs. can be, or is carried, a reducing valve is installed to provide the desired pressure, and steam is taken from the boiler for the atomizing nozzle. The air compressor is used only when the boiler pressure falls below 3 lbs. This method of operation eliminates the use of motor and compressor, except at times when starting up and generating steam in the boiler at a pressure too low for perfect atomization of the oil.

It is obvious that at least one form of safety device is eliminated, because the design makes it impossible for any oil to pass into the furnace unless it is blown from the oil nozzle. Therefore, if the compressor is not running, no oil can possibly enter the furnace. Provision is then made to prevent the air blast except at such times as the gas pilot is available to ignite the oil, and in case the oil is not ignited, the compressor action ceases. Usual methods of thermostatic control are employed.

The capacity of each unit is such that, in installations of less than 1200 sq. ft. of direct steam radiation, one unit will take care of the load. In larger installations than this, multiple atomizers from two to eight in number are installed, depending upon the rating of the boiler. Such arrangement provides for correct flame distribution, producing increased boiler capacity and efficiency.



Cross-Section of Caloroil Burner Showing Fuel Supply and Control System



Detail of Caloroil Atomizing Nozzle Showing Worm-Gear Adjustment

In these cases only a single motor and compressor unit is required. Such an installation, of course, produces great flexibility, as, with a multiple-unit atomizing installation, and duplex-motor and compressor installation, there would seem to be little chance for a breakdown.

It is stated by the Caloroil Company that, due to the extreme ruggedness and slow speed of the motor and compressor unit, and to the simplicity of the atomizing and vaporizing unit, very little servicing is required.

Caloroil burners Type O are listed by the Underwriters to burn distillate or fuel-oil not heavier than 28° A. P. I.

Caloroil burners are also passed by the New York City Bureau of Standards and Appeals to burn Grade A and Grade B fuel.

7.—Oil-O-Matic

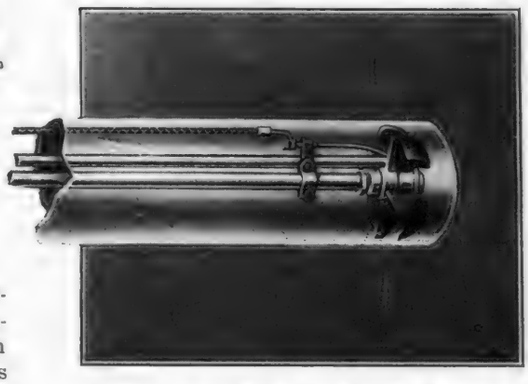
THE Oil-O-Matic oil burner is manufactured by C. U. Williams & Son Co., Bloomington, Ill. Its distribution is, naturally, greatest in the middle west, but a recent intensive advertising campaign and organization of sectional distributors, with several hundred dealers, has placed it before the greater part of the country.

The burner is a mechanical draft, atomizing type, with gas pilot, electrically ignited. Oil is either fed to a metering pump by gravity, or by pump suction, from which point it is fed to the burner by pressure. Temperature control is automatic.

The essence of the burner is the combination of the metering pump and an atomizing pump, the former delivering the fuel in a predetermined quantity to the latter, where it is mixed with air from the blower, and literally churned into foam. This mixture of air and oil-foam is delivered through burner pipes into the oil spiral, and out through the orifice. At this point the emulsified oil is thoroughly mixed with the air from the blower, and the mixture is given a swirling motion by the air spiral, a stationary set of vanes set in the end of the blast pipe.

The metering pump is mounted directly on the atomizing pump, forming its cover; its function is to deliver fuel at a fixed rate, without regard to the gravity of the oil.

The pump consists of a plunger, a rotor and an eccentric ring, with an adjusting screw so mounted that, through it, the eccentric ring may be shifted to increase or decrease the stroke of the plunger.



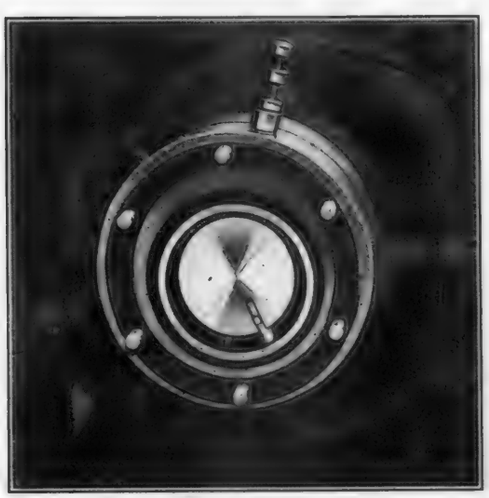
End of Oil-O-Matic Blast Tube Showing Air Spiral, Oil Pipe and Spark Terminal

The atomizing pump is attached directly to the motor shaft and consists of a vane pump with six vanes. Oil and air are taken in on one side of the cylinder, the oil coming direct from the metering pump. Through the action of the vanes. the oil is beaten into a froth, in which form it is passed to the atomizing jet under 2 to 4 lbs. pressure.

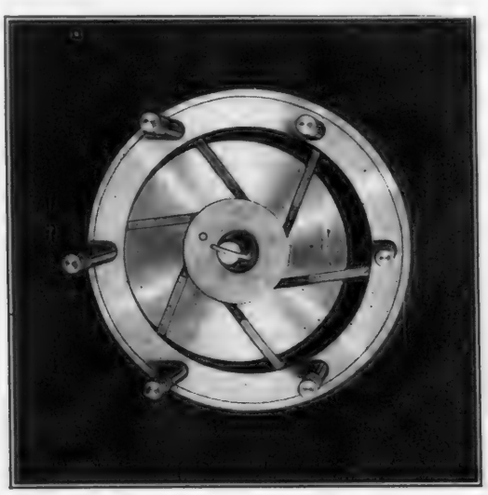
An automatic gas valve, actuated by the pressure from the atomizing pump, serves to open the gas valve when the burner motor circuit is started, and, through dash-pot control, gas is allowed to flow to the pilot for 10 to 25 seconds. The spark coil switch, of the Mercoid type, is attached to the gas valve rocker arm, and when the gas pilot is turned on by the movement of the rocker arm, the spark coil switch is closed by the same motion. The closing of the gas valve opens the spark coil switch, so that neither gas nor spark are used except for a period of ten to twenty seconds when the burner is started.

An automatic cut-off valve is interposed between the oil tank and the metering pump. It is opened by pressure created by the atomizing pump, working on a diaphragm, which actuates a lever, lifting the valve from its seat. This valve then remains closed except when the motor is running.

The "Model G" Oil-O-Matic is listed by the Underwriters to burn kerosene, distillate, gas oil or fuel oil not heavier than 28° A.P.I.



Oil-O-Matic Metering Pump



Oil-O-Matic Atomizing Pump

New Books

FAN ENGINEERING, the Buffalo Forge Company's engineers' handbook on the application of centrifugal and propeller fans and fan system apparatus, has appeared in a new edition. The first edition of this useful volume was published by the Buffalo Forge Company in 1914 and edited by Willis H. Carrier. In 1920 a second printing was found necessary. The present edition, edited by Richard D. Madison under the direction of Mr. Carrier, is a thorough revision and brings the book up-to-date regarding data, general practice and apparatus.

In preparing the material for the second edition special care was taken in its arrangement so that the various subjects could be readily located and the desired information easily obtained. To this end the book is divided into three parts. The first part deals with the physical properties of air, heat and humidity, the flow of air in general and the fan systems of air distribution in particular. In order to give to the psychrometric charts the necessary space, they have been prepared in folded form, with small-scale diagrams on the adjacent pages for graphically illustrating the method of obtaining the desired information. Numerous other tables and charts have been added to Part I.

Part II relates to the application of air and air movements to the various classes of work for which fans may be adapted. This part has been rewritten to include research data and current practice in heating, ventilation, air washing, drying, mechanical draft, exhausting and conveying and miscellaneous applications. Part III opens with numerous examples of selection of fans and heating and ventilating apparatus, followed by a section on materials, stresses, balances, etc. The remainder of this part contains performance tables and general information concerning Buffalo fans and fan system apparatus, including Aerofin and Vento heaters and Carrier air washers.

A unique manner of presenting the maximum of fan performance data in a limited space has been adapted, involving the use of multi-rating tables, one of the Duplex Conoidal ventilating fans and the other of the Turbo Conoidal stoker fan. Factor tables for other types of fans using the same housings are therefore condensed to a few pages.

In the appendix appear typical specifications, guarantees and engineering codes; the A.S.H. & V.E. fan-test code is reproduced in full. Several pages of useful data that are particularly applicable to fan engineering are given. Size 4½ x 7 in. Pp. 612, printed on thin paper, with flexible cover. Indexed complete and cross-referenced. Price, $4.00, postpaid. Published by the Buffalo Forge Company, 490 Broadway, Buffalo, N. Y., or may be had through the book department of THE HEATING AND VENTILATING MAGAZINE.

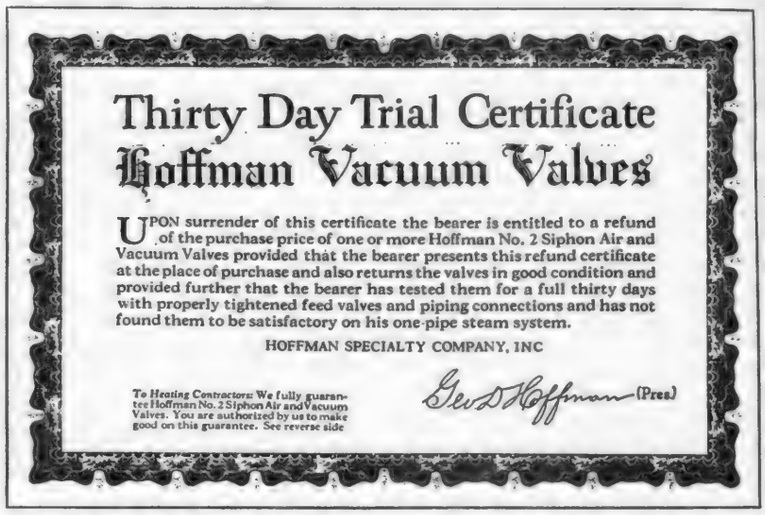
DRAFTING METHODS, by Douglas S. Trowbridge, assistant professor at New York University, is published by Codex Book Co., New York. The book contains, in boiled-down form, a large amount of material that Professor Trowbridge has been collecting for years, mainly for use in his classes. There are chapters on the selection and use of drawing instruments, and one, of particular value to those engaged in the preparation of heating plans, on lettering. Many short-cuts are given that will economize time and assure good work. Symbols and abbreviations are treated in a separate chapter, with due regard to standards in common use. Another chapter on up-to-date filing methods for engineering data and drawings is well worth study, in view of the all too careless methods in vogue in many places where the drafting room is small. Two chapters on "kinks" contain valuable data picked up in various parts of the country and valuable to any one who has drafting to do. The greater part of the material in the book has never appeared in print, which greatly enhances the value of the volume. Price, $2.50. Size, 5½ x 8½ in., Pp. 152.

Free Trial Selling Plan

A selling plan involving a refund of the purchase price if buyer is not satisfied after a 30-day trial has been adopted by the Hoffman Specialty Company, in connection with the marketing of the Hoffman No. 2 siphon air and vacuum valve. C. V. Haynes, vice-president and general manager of the company, speaking of the new plan, stated that the Hoffman Specialty Company has been selling Hoffman valves with a written guarantee of five years' service.

"In the new plan," said Mr. Haynes, "we do more than that. We guarantee increased heating comfort and economy of operation. We let the customer judge for himself whether the service rendered by the valves is satisfactory."

The company's 30-day free trial offer is featured in the consumer advertising campaign for the No. 2 vacuum valve now appearing in the national magazines. Each advertisement urges the reader to test the valve for 30 days without risk on his one-pipe system. If the installation does not give more comfort with a saving of fuel, the valves may be returned to the heating contractor for a refund of the purchase price. The advertisements explain that the trial test may be made with one valve. If the purchaser does not find that the radiator equipped with the No. 2 vacuum valve remains hot longer after the fire is banked than radiators equipped with other venting valves, he may get his money back.


Thirty Day Trial Certificate
Hoffman Vacuum Valves

UPON surrender of this certificate the bearer is entitled to a refund of the purchase price of one or more Hoffman No. 2 Siphon Air and Vacuum Valves provided that the bearer presents this refund certificate at the place of purchase and also returns the valves in good condition and provided further that the bearer has tested them for a full thirty days with properly tightened feed valves and piping connections and has not found them to be satisfactory on his one-pipe steam system.

HOFFMAN SPECIALTY COMPANY, INC

To Heating Contractors: We fully guarantee Hoffman No. 2 Siphon Air and Vacuum Valves. You are authorized by us to make good on this guarantee. See reverse side

Geo D Hoffman (Pres.)

Certificate Used in 30-Day Free Trial Selling Plan

The 30-day trial certificate is being mailed to prospects secured from the magazine advertising, as well as in the direct-mail campaign.

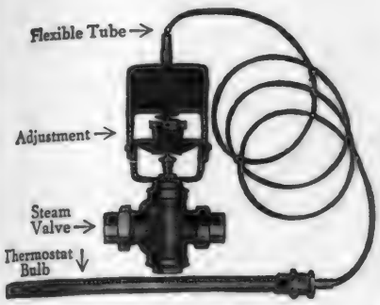
Deaths

HENRY BOND, for many years an official of the American Radiator Company, and at the time of his death a director, died in Melrose, Mass., August 10. He was sixty-nine years old. Mr. Bond was born in Ware, Mass. Prior to his association with the American Radiator Company, he was purchasing agent for the Waltham Watch Company.

ROLLA S. WOODRUFF, former governor of Connecticut, and president of C. S. Mersick & Co., New Haven, Conn., jobbers of heating and plumbing supplies, died at his home in Guilford, Conn., in his seventy-first year. He became president of the company when it was incorporated in 1905. Governor Woodruff's political career started with his election to the State senate in 1903. When his term expired in 1905, he was elected lieutenant-governor, and, the following year, governor.

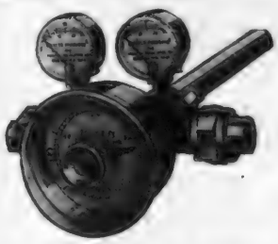
3 of the more than 50 Powers regulators

(2196A)



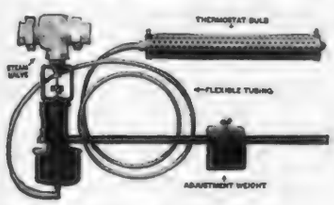
The Powers No. 11 Regulator

This regulator is self-operating. It is designed for control of liquid temperatures or of any material in which the thermostatic bulb can be immersed. Used on Steam Heated Tanks, Vats, etc. Simple, accurate and easy to install.



The Powers No. 14-B Regulator

This regulator is operated by air pressure. It is extremely sensitive, and controls temperature within a fraction of a degree. Used on retorts, baking ovens, tanks, etc.



The Powers No. 15 Regulator

A self-contained regulator, designed for the control of air temperatures in drying rooms, kilns, etc. Requires no air or water power for its operation. May be adjusted for different temperatures, at will.

Ask about our "Special Test" Offer

Name the place or process where you think automatic temperature control might benefit and we will respond with a definite recommendation, price, and full particulars of our "Special Test" offer, whereby you may see the results you want, actually produced in your client's plant. If he is not satisfied, he won't even be asked to buy.

Do you get Results like this?

Look closely! The temperature record line is so nearly a perfect circle it looks almost like one of the circles printed on the chart. It tells a story of *even temperature* maintained by a POWERS automatic regulator on a secret process in a large Rayon—fibre silk—mill.

In this installation the regulator controls both heating and cooling mediums, maintaining a remarkably accurate room temperature.

During the week this record was made, the outdoor temperature fluctuated continuously — from 72° to 40° F. Week after week, similarly perfect control is recorded—not only here, but wherever a POWERS regulator is on the job.

If your clients are not getting results like this you owe it to yourself to find out what we can do for them. In our 34 years of specialization in temperature control, we have mastered many difficult problems, and through this experience have developed over 50 different regulators, and have one to fit *any* condition—or will make a new one.

THE POWERS REGULATOR COMPANY

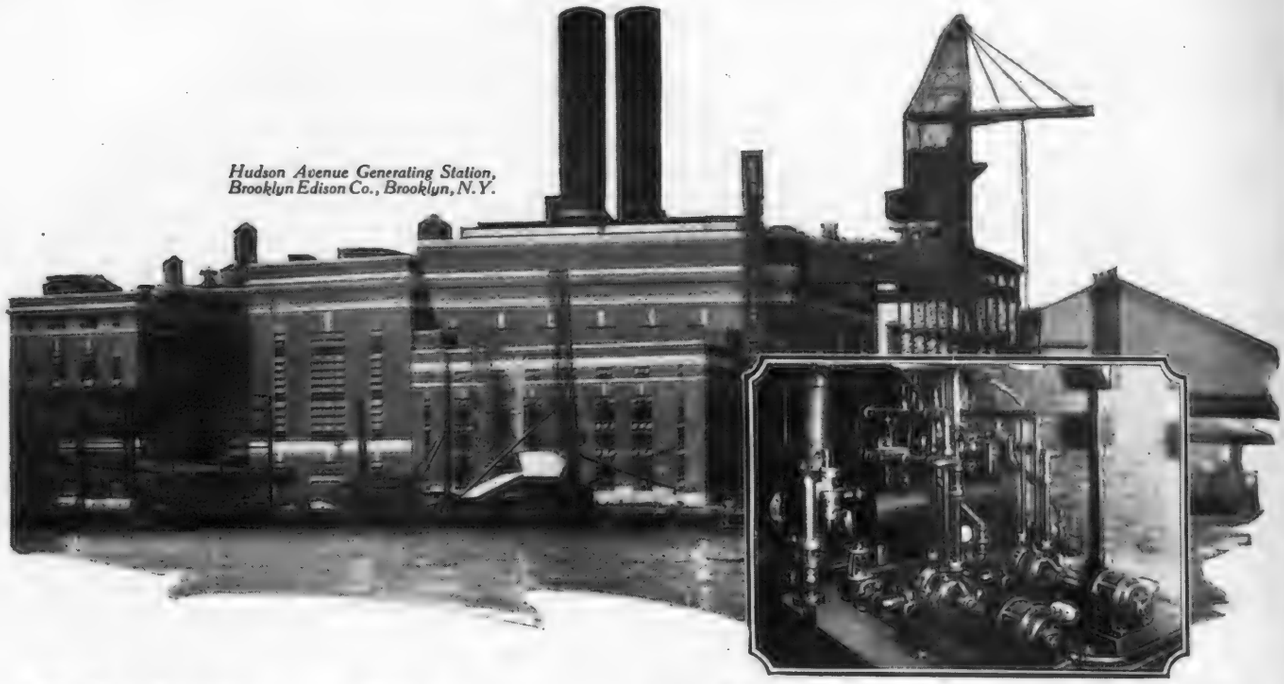
34 years of specialization in temperature control

2718 Greenview Ave., Chicago

Atlanta, Baltimore, Boston, Buffalo, Butte, Mont., Charlotte, N. C., Cincinnati, Cleveland, Denver, Des Moines, Detroit, El Paso, Houston, Indianapolis, Kansas City, Los Angeles, Milwaukee, Minneapolis, Nashville, New Orleans, New York, Philadelphia, Pittsburgh, Rochester, St. Louis, San Francisco, Seattle

CANADIAN OFFICES

Toronto, Winnipeg, Montreal, Calgary, Halifax, Vancouver



Hudson Avenue Generating Station, Brooklyn Edison Co., Brooklyn, N.Y.

One of the two motor-driven Jennings Hytor Vacuum Pump Units, Duplex Type B, installed on the return line heating system in the Hudson Avenue Station.

Hytors serve this 500,000 K.W. power station

In the Hudson Avenue Station of the Brooklyn Edison Company, a Jennings Hytor Type B Duplex Vacuum Pump Unit is relied on for removing the condensate and air from the return line vacuum heating system in the turbine room, boiler house, and service building. Condensate is discharged into one of the station's 45,000 gallon water storage tanks located in the boiler house basement.

A second Jennings Hytor, of the same type, size and capacity, serves the switch house and frequency changer building. Condensate is pumped into the same 45,000 gallon storage tank in the boiler house basement.

For this installation, as well as for all others where only the finest equipment is used, Jennings Hytors are a logical choice. They can always be counted on for unfailing performance year after year. Jennings Hytors are built to make good and they do.

NASH ENGINEERING COMPANY

So. Norwalk **Connecticut**

Branch Sales Offices: Atlanta, Boston, Buffalo, Chicago, Cleveland, Dallas, Denver, Detroit, Houston, Indianapolis, Kansas City, Los Angeles, Minneapolis, New Orleans, New York, Philadelphia, Pittsburgh, Portland, Richmond, St. Louis, Salt Lake City, San Francisco, Seattle Washington. **In Canada:** Montreal, Toronto, and Vancouver. **European Offices:** London, England, Norman Engineering Co.; Brussels, Belgium and Amsterdam, Holland, Louis Reijners Co.; Oslo, Norway, and Stockholm, Sweden, Lorentzen & Wettre.

Jennings Hytor

RETURN LINE AND AIR LINE VACUUM PUMPS CONDENSATION AND CIRCULATING PUMPS

Trade and Miscellaneous Notes

Miscellaneous Notes

National Safety Council's Fourteenth Annual Safety Congress, which will be held in Cleveland, O., September 28 to October 2, inclusive, will be addressed by 250 speakers in 70 sessions. In the Safety Exhibit, which will be an adjunct of the congress, practically all of the former exhibitors and twenty-two new exhibitors will be represented with displays of safety devices, appliances and equipment.

American Oil Burner Association has arranged to hold its next year's meeting in Detroit, Mich., at the Book-Cadillac Hotel. The dates are April 6-8, 1926.

Tenth Exposition of Chemical Industries, which will go on at the Grand Central Palace, New York, September 3 to October 3, will feature a one-week course of intensive training in the practical technique of chemical engineering. All students of recognized colleges, as well as practical chemical engineers who desire to brush up on fundamentals, are eligible to take the course which is without cost. Lectures will be given during the morning hours at the Grand Central Palace prior to the official opening of the exposition each day.

Heating Engineers' Association of Brooklyn, 150 strong, held its annual outing at Glenwood Landing, L. I., July 14. President Thomas J. Long, together with Charles P. Bender and A. W. Dovel, took charge of the outing program which wound up with a weird baseball game in which the score showed a victory for the contractors over the salesmen of 14 to 13.

American Gas Association will hold its annual convention in Atlantic City, October 12-16, 1925. As in former years, the convention sessions and exhibits will be on the Steel Pier.

American Welding Society will hold its Fall meeting in Boston, Mass., October 21-23, with headquarters at the Massachusetts Institute of Technology, Cambridge. Exhibits of welding, welded products and actual demonstrations of welding and cutting will be featured at the meeting. It is stated that the applications of welding have more than trebled during the past few years. Among the papers will be one on "Gas Welding of Power Plant Piping," and a series of short addresses on "Selection of Materials for Welding."

National Warm-Air Heating and Ventilating Association will hold its mid-year meeting in Urbana, Ill., December 1-2.

Changes in the Cost of Living between July, 1914 and July, 1925, according to a survey just completed by the National Industrial Conference Board, show the increase to be 68.7%. Since March 15, 1925, the cost of living has risen approximately 2%. From March to July, 1925, there were average increases in the cost of food of 6%; of clothing, 1.1%, and of light, 0.7%. Average shelter and fuel prices decreased 1.7% and 3.3%, respectively, while average sundries prices did not change.

Harvard Advertising Awards, founded in 1923 by Edward W. Bok, calls the attention of industrial advertisers and those using business and trade papers to the fact that advertisements or advertising campaigns appearing in the business press are eligible for consideration under the terms of the Awards for 1925. Three awards will be made of $2,000 each for campaigns and research and three $1,000 awards for meritorius individual advertisements. For the current year advertising published during the period from October, 1924, to January, 1926, is eligible for consideration.

INVESTIGATE AUTOVENT UNIT HEATERS

Whenever you have a large open area to heat and ventilate figure on Autovent Unit Heaters.

They can be used to induct and temper outside air or used as a re-circulating system.

They will heat up the room in the morning quicker than any other method of heating. Complete control of the heated air is afforded at all times.

Send for Engineering Data Book for your files.

ACTIVE SALES OFFICES AND AGENCIES IN ALL PRINCIPAL CITIES

AUTOVENT FAN & BLOWER CO.

730-738 W. Monroe Street Chicago

July Building Records, according to the F. W. Dodge Corporation's review of construction activity, reached the highest July total on record. Contracts in the 36 eastern States (which include about seven-eights of the total construction volume of the country) mounted to $529,000,100. In only two previous months has this total ever been exceeded, April and June of this year. The decrease from June was only 2%, while the increase over July of last year was over 53%. Last month's record included: $224,712,500, or 42% of all construction, for residential buildings; $72,743,400, or 14% for public works and utilities; $67,165,900, or 13%, for commercial buildings; $58,148,000, or 11%, for industrial plants (including a 30-million dollar power development in Ohio); and $57,572,000, or 11%, for educational buildings (including large building projects for Harvard, Yale and Pittsburgh Universities).

Last month's figures brought the year's total of construction started to date up to $3,189,173,800, an increase of nearly 20% over the first seven months of 1924. At the end of June this year was only 15% of last year.

Chicago Heating and Piping Association held its initial outing at Schiller Park, Forest Preserve, a few miles outside of Chicago, August 8. In spite of the threatening weather, an imposing parade of 135 motor cars carried the members and guests to the park. The outstanding features of the day were a ball game between the salesmen and the fitters and a tug-of-war between the contractors and the fitters. The fitters were victorious in both events.

Manufacturers' Notes

O-E Specialty Mfg. Co., Milwaukee, Wis., has established a branch sales office and warehouse in Los Angeles, Cal., in charge of L. W. Stierlin. The new office is located at 244 I. W. Hellman Building. The company has also opened a sales office in San Francisco, in the Monadnock Building, in charge of E. S. Stott. Both Mr. Stierlin and Mr. Stott were formerly connected with the American Radiator Company.

Richmond Radiator Co., New York, has increased its capitalization from $4,725,000 to $15,000,000.

Excelso Specialty Works, Buffalo, N. Y., is enlarging its manufacturing facilities by the erection of a new factory building with a floor area five times that of its present buildings. The new factory, which is now under construction, is on Clyde Avenue, in the Kensington manufacturing district, and has its own railroad siding.

Duriron Co., Inc., Dayton, O., announces the appointment of two representatives who will handle the company's line of acid-proof drain pipe, fittings and laboratory equipment, Rex W. Williams, who will cover Utah, southern Idaho and a portion of Wyoming, with headquarters in Salt Lake City at 402 Scott Building; and The Sullivan Valve & Engineering Co., of 1008 South Montana St., Butte, Mont., covering the State of Montana and the northern part of Idaho.

Trane Co., La Crosse, Wis., announces that H. Addington, heating engineer, has been transferred from the company's home office to the Cleveland, Ohio, office where he will be associated with H. Porter, the manager of the Cleveland branch.

Republic Flow Meters Co., Chicago, Ill., announces the opening of a factory branch office in Buffalo, N. Y., at 535 Bramson Building. The office will be in charge of W. W. Barron, formerly of the company's Chicago office. Mr. Barron is an experienced engineer in the power plant field. The company has also opened a branch office in Cleveland, under the management of L. C. Wilson.

Gorton & Lidgerwood Co., New York, has appointed J. Wilbur Osborne, 1646 Avalon Road, Cleveland, O., as Cleveland sales agent for the Gorton single-pipe vapor heating system.

Republic Boiler & Radiator Co., Baltimore, Md., is this company's new address, its former location being in Washington, D. C. Factory quarters have been taken in Woodberry, just outside of Baltimore proper. In addition to the company's Brooklyn, N. Y., office and

SPRACO PRODUCTS

SPRACO
AIR FILTERS

SPRACO PRODUCTS

For General Ventilating Systems Are Indispensable

SPRACO Air Filter

Write for bulletin No. 81 on SPRACO AIR FILTERS

They excell because of

High Cleansing efficiency, due to the use of filter media comprising a stack of densely compacted, viscous coated, variegated expanded metal sheets with edges opposing the incoming air, presenting the largest amount of dust collecting surface in a given space.

Minimum resistance to air flow consistent with large cleansing capacity.

Progressive Filtration—filter media arranged from coarse to fine in direction of air flow.

Minimum operation and maintenance cost, no moving parts.

Cleaning and Charging Tanks will accommodate five cells at one time.

SPECIFY SPRACO AIR FILTERS AND BE ASSURED OF CLEAN AIR.

Air Coolers
Cooling Ponds
Spray Nozzles

SPRAY ENGINEERING CO.
BOSTON, MASS.

Air Washers
Strainers
Flow Meters

Yours for the asking

This book not only tells you about Underground Steam and Hot Water Insulation, but shows it to you.

Do not fail to get your copy.

A book on underground insulation describing one of the largest installations in the world

EVERY heating engineer should have this book containing complete data on the 19,400 ft. installation of the Johns-Manville Underground Insulation System on the steam and hot water lines of Cornell University.

It includes descriptions, tests, drawing and plans, progress and detail photographs, and other interesting pictures and text. It should be yours for reference. Send for your copy now.

JOHNS-MANVILLE INC., 292 MADISON AVE., AT 41st STREET, NEW YORK CITY
Branches in 63 Large Cities. For Canada: CANADIAN JOHNS-MANVILLE, Ltd., Toronto

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Through

Asbestos

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INSULATION
BRAKE LININGS
ROOFINGS
PACKINGS
CEMENTS
FIRE PREVENTION PRODUCTS

JOHNS-MANVILLE

Underground System of Insulation

warehouse, located at 110-162 Imlay St., care of the New York Dock Building No. 10, Brooklyn, N. Y., the company now maintains another branch in Washington, D. C., at 1214 New York Avenue, N. W.

Kewanee Boiler Co., Kewanee, Ill., held a sales meeting of its branch managers, July 18, at which branch managers of the larger territories were given an opportunity to discuss their problems and prospects for the balance of the year. At the sales session, which followed the regular quarterly meeting of the directors, Sales Manager R. B. Dickson was in charge. According to a survey of the prospects for business during the balance of the year, the average estimate for all territories reporting indicated a slight improvement over last year. All of the directors were present: E. E. Baker, B. F. Baker, M. F. Moore, H. D. Cherry, E. F. Wagner, R. B. Dickson, Homer Addams, C. V. Kellogg, C. A. Burton, H. E. Purseli, Arthur Cook.

The following branch managers attended: A. B. Martin, T. J. Hester, H. E. Hague, C. W. Colby, J. H. Van Zandt, F. G. Weimer, H. J. Sperzel, A. W. Fleming, R. B. Stanger, W. J. Carroll, F. D. Pfeiffer; also Gene Bradley, M. W. Maloney, Fred C. Burns; and from the home office: J. C. Walton, R. M. Powers, V. E. Hunt, Joe Hoffrichter, R. V. Hunt, William Moore, Henry Bennison, E. Karau, H. B. Swain, J. J. Graham, J. F. Dickson, E. W. Beckman, Roy Powers, E. D. Quirke, Dan Moore, C. E. Bronson.

A. M. Byers Co., Pittsburgh, Pa., has opened a district office in St. Louis, Mo., at 517 Chemical Building, with R. J. McKay in charge. The district comprises the territory from Nashville, Tenn., to Denver, Colo.

Minneapolis Heat Regulator Co., Minneapolis, Minn., at its recent sales convention, held at the Minneapolis factory, laid plans for a greatly enlarged sales and advertising program. Without exception, the representatives present reported greatly-increased demands for the company's equipment. Special success was reported in the sales of the company's Model 77 room thermostat, with the Minneapolis 8-day clock. The importance of the clock on automatic heat control devices received much attention at the convention. Its mechanism for automatically checking the fire at night and raising the temperature level for day-time heating were declared to be important features of automatic control. Other speakers emphasized the value of the Minneapolis principle of low-voltage thermostatic control, with thermostatic metal as the actuating element, and how it eliminated the costly annoyance of tearing out walls and running a conduit to the upstairs rooms. Discussions on these and other subjects were led by President W. H. Sweatt, H. W. Sweatt, C. B. Sweatt, and A. R. Olson and George Enzinger, of the Olson & Enzinger Advertising Agency, Milwaukee. The convention was attended by the company's branch office managers and field service men.

A. H. Wolff Gas Radiator Co., New York, has elected H. L. Whitelaw vice-president.

American Radiator Co., New York, has appointed A. E. Geddes manager of its Bayonne plant, at Bayonne, N. J.

W. A. Russell & Co., New York, has appointed H. W. Reis as vice-president and manager of sales. Mr. Reis was formerly manager of sales of the Curtis Bay Copper & Iron Works, Baltimore.

McClave-Brooks Co., Scranton, Pa., has appointed James P. Greenwood sales manager for its Chicago district territory, with offices at 1540 Conway Building, Chicago. Mr. Greenwood was formerly State engineer for the State of Texas and has been a contributor to THE HEATING AND VENTILATING MAGAZINE.

Donnelly Systems Co., New York, has appointed G. C. Mashey as representative in New Jersey and the metropolitan territory. Mr. Mashey will specialize in the sale of the Donnelly reducing valve for temperature control. He was formerly with Strong, Carlisle & Hammond Company and, more recently, represented the Dearborn Chemical Company.

WHY LET THAT UNHEATED BUILDING WORRY YOU

We manufacture Unit Heaters and Fan Heating Systems for every need. If steam is not available, our all steel direct fired Fan Furnace will meet your requirments.

Send us your heating problems and we will show you the easiest and cheapest way.

Recommendations and prices furnished cheerfully without cost to you.

COMET UNIT HEATER

Suitable for use where steam and hot water is available. This Heating Ace is especially adapted where compactness and lightness in weight is of importance. For complete description write for Bulletin No. 85.

DIRECT FIRED FAN FURNACE

For use where steam or hot water is not available. For complete data write for Bulletin No. 90.

THE NEW YORK BLOWER COMPANY

CHICAGO, ILL. *Branch Offices in Principal Cities* LA PORTE, IND.

THE FAMOUS SYLPHON BELLOWS FILLED WITH A VOLATILE LIQUID
FLEXIBLE TUBING ALSO FILLED WITH VOLATILE LIQUID
THERMOSTATIC BULB ALSO FILLED WITH VOLATILE LIQUID

Sylphon

Every Sylphon Regulator Operates from Temperature Alone, Without Auxiliary Power.

The thermostatic bulb is placed in the liquid or air to be controlled, the valve in the steam line. Any variation of temperature of the medium to be controlled acts directly on the valve in the line. Operation is thus self-contained, from temperature alone, without auxiliary power such as electricity, compressed air or water. First cost is small —installation practically nothing—upkeep nil.

Points of simplicity and accuracy that Sylphon Regulators alone possess

The one-piece, famous, seamless, metal bellows. It will not bend, burst, or leak, and has greatest extent of movement of any known expansion member.

Patented trapped vapor feature, upon which variations of temperature act directly and are instantly relayed through bulb, tube and bellows to the valve in line.

Regulators can be installed by inserting valve in steam line, bulb in tank. After first setting, no attention is required. There is no auxiliary apparatus necessary.

Sylphon Engineering Service

Thirty-six offices are maintained where heating men may draw on our 20 years of gainful experience in temperature control as applied to hospitals, clubs, apartments and industrial plants.

This diagram shows the extreme flexibility of the Sylphon bellows

No expansion member except the *genuine* Sylphon bellows has such extreme flexibility, sensitiveness and long life. This bellows is used as the expansion member in all Sylphon Regulators. Refuse imitations.

Let us send you our latest temperature regulation literature.

Ask for Bulletin WTR-105

THE FULTON COMPANY, KNOXVILLE, TENN.

ORIGINATORS AND PATENTEES OF THE SYLPHON BELLOWS

Sales Offices in: NEW YORK, CHICAGO, DETROIT, BOSTON, PHILADELPHIA and all the principal cities in U. S.

European Representatives: Crosby Valve & Engineering Co., Ltd., 41-42 Foley, St., London, W. 1, England

Canadian Representatives: Darling Bros., Ltd., 120 Prince Street, Montreal, Canada.

Continental Heater Corporation, Dunkirk, N. Y., has started work on a steel and concrete addition to its new boiler plant which was recently completed. The new addition is 50 by 250 ft., making the boiler department building 150 by 365 ft. The old plant will be devoted exclusively to the manufacture of radiation. The shipping siding has been extended into a new warehouse building, making it possible to load ten cars at one time. The shipping platform under roof extends the full length of the siding. Raw materials are taken in on a separate siding located between the boiler and radiator plants. This track is spanned by a 100-ft. traveling crane equipped with a large magnet for unloading iron.

Vapor Engineering Co., New York, has been appointed sole agents for the metropolitan district for the Thermoflex line of vacuum heating specialties, manufactured by the W. D. Cashin Company, Boston, Mass.

S. T. Johnson Co., Oakland, Cal., has opened a new factory branch in Philadelphia, at 311 North 20th Street, under the management of N. W. Wilson. J. C. Johnson, president of the company, has been in Philadelphia supervising the work of opening the branch.

Hardinge Bros., Inc., Chicago, Ill., manufacturer of the Hardinge oil burner, announce the formation of another company with headquarters in Buffalo, N. Y., to be known as the Hardinge Oil Heating Corporation, organized to manufacture oil heating equipment. The two companies will operate in conjunction.

Haynes Selling Co., Inc., Philadelphia, Pa., is now located in new and larger quarters at 2013 Sansom Street. The company handles the Hoffman controlled heat and venting valves, O.E.F. water heaters, Reed air filters, Taco water heaters, U. S. ozone generators, Baetz air heaters and the McDonnell and Miller duplex water feeders.

Chicago-Wilcox Mfg. Co., manufacturer of the Wilcox patented gasket, announces that it is now in full production at its new plant at 77th Street and Anthony Avenue, Chicago. This company is an amalgamation of the Chicago Gasket Company and the Wilcox Mfg. Company, the merger having been effected last February. The new plant, which has a capacity 1000% greater than the combined capacities of the two former companies, is now able to meet the need for every form and type of gasket, washer and shim, as well as for the Wilcox gasket.

Cokal Stoker Corp., Chicago, Ill., reports the installation of Cokal Combustikators, the company's new stoker feed attachment, in Chicago's $3,336,000 co-operative apartment, the Sheridan-Brompton. This apartment is the largest and one of the most luxurious in Chicago.

New Incorporations

Standard Oilgas Heating Co., Lansing, Mich., incorporated to manufacture oil and gas-burning equipment. The company has started the erection of a one-story plant to cost $25,000.00.

Quaker Mfg. Co., 140 No. Dearborn St., Chicago, Ill., capital $65,000.00, to manufacture heating and ventilating systems. Incorporators: George C. Bunge, Stanley B. Daudney, and H. J. Pickering.

E. F. Keating Pipe Bending & Supply Co., Hartford, Conn., capital $150,000, all common stock, to fabricate power-plant piping, including bending and van stoning of tubular products. President and treasurer, E. F. Keating; vice-president, H. K. Herbinson; secretary, Charles J. Gannon. The company will maintain a New York office at 452 Water Street.

Holley Mfg. Co., 529 Seventh Ave. So., Minneapolis, Minn., has incorporated with a capital stock of $50,000.00, to manufacture and sell heating appliances. The company will specialize on its orifice control method which it has been developing for the past three years. A new type of orifice has been designed for application to residences and buildings which ordinarily would be heated by hot water plants, with a view of giving to the steam plant the same characteristics as hot water plants. This application, it is pointed out, eliminates the danger of freezing of radiators. The company reports, among its recent orders, one for the equipment of a large part of the new Buhl Building, twenty-six stories high, in Detroit, and also the General Hospital in Madison, Wis.

E. H. Hosford Co., Boston, Mass., capital $20,000, to deal in heating supplies. Incorporators: Edward H. Hosford and Edmund B. Hopkins, both of Malden, Mass., and Arthur F. Hosford, of Natick, Mass.

Modern Heating & Engineering Co., Boston, Mass., capital $25,000. Incorporators: Robert D. Mayo, Lexington, Mass.; Harland F. Brown, Framingham, Mass., and John J. Whittlesey, Newton Center, Mass.

Dahlquist Mfg. Co., 36 West 3rd St., So. Boston, Mass., capital $100,000. Incorporators: Theodore W. Dahlquist,

STEAM TRAPS
AIR TRAPS
STEAM SEPARATORS
EXHAUST HEADS
WRIGHT
WRIGHT-AUSTIN CO.
OIL SEPARATORS
BOILER ALARM WATER COLUMNS
STRAINERS
AUSTIN
DETROIT, MICHIGAN

The HOLLEY *Manufacturing Co., Inc.*
RADIATOR
ORIFICE
CONTROL
529 Seventh Street So.
MINNEAPOLIS, MINN.

Patent Allowed

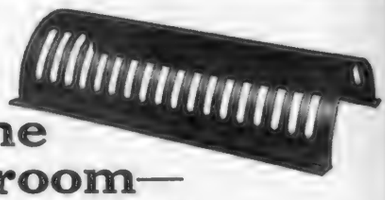
By using these simple devices in the supply ends of the radiators and varying the steam pressure on the plant to meet the weather needs, a very accurate and practical distribution of heat is obtained throughout the entire building.

Simple, practical, logical and economical, this system is being well endorsed. Some most interesting orders have been shipped recently.

We will appreciate your inquiries both for heating systems and for special applications of orifice distribution.

Literature mailed on request.

Specify the Supreme Mushroom—



for your next theatre or auditorium installation

Greater Air Capacity, Unbreakable, Ornamental, No Rattles, Low Cost.

SEND FOR PARTICULARS

Supreme Heater & Ventilating Corp.
Engineers and Manufacturers, ST. LOUIS, MO.
SALES ENGINEERS—Some desirable territory is open on this line.

GRINNELL Piping Systems are famous the country over for their fine appearance, low cost maintenance and operating economy. When it is possible to buy the very same proved materials used in such equipments, it seems foolhardy to think of buying the kind of speculative stuff the price-paring tactics of F. O. B. Jurdine and his ilk are bound to produce.

GRINNELL
PIPE FITTINGS

George Jurdine (F. O. B.) tells his secret

"GOING through to Chicago tonight, Mr. Jurdine?" asked the steward, adressing a man who was finishing a sumptuous dinner at the same table with Volker and Treadwell.

"Only to Columbus, this time," came the reply. "I expect to locate there."

Treadwell shot a glance at his companion. Both knew that this must be George Jurdine, the man proposed by their General Manager for the presidency of the company. They were to have met him for the first time in the morning at the Columbus factory.

Introductions over, Treadwell, Chairman of the Board of Directors, said "Mr. Volker, our treasurer, is worrying about the excessive cost of the reconstruction and modernization work at the Columbus Plant.

"He finds that actual quotations on materials, as turned in by our Consulting Engineer, do not square with the estimate worked out by our president six months before he died. That old estimate was taken as the basis for our financial program."

"I can understand that," said Mr. Jurdine. "Your president and I were trained in the same school of hard buying. As purchasing agents in the old days we learned our lesson. No consulting engineer has the instinct for getting rock bottom prices. He can't visualize materials in the maker's shipping room waiting for a buyer, nor can he read the lesson of the empty car standing alongside the shipping platform. I make F. O. B. stand for 'Ferret Out Bargains.' And, likewise, on all installation work I go after rock bottom prices and get them."

"But," exclaimed the treasurer, "we propose to install all these materials ourselves."

"That makes no difference," said Mr. Jurdine, emphatically. "Let me tell you an old secret of mine. Where you get quotations on any materials used in power, heating and process piping, go out and shop the way a thrifty housewife does. List your requirements by items. Let 'em all see they must sharpen their pencils. Then reply to each one that he is high. And when they are through cutting tell them they need to shave prices. Take your time, sit back, and wear them out."

Treadwell: "That kind of buying ought to help balance our budget, Volker."

Volker: "Why can't we get a stateroom and go over these figures? With a few facts to lay before the Consulting Engineer tonight we can hold up the orders he insists on placing at once."

Mr. Jurdine shifted uneasily, gathered his change from the waiter and suavely said: "I would be very glad to, gentlemen, but I have a quarterly report to finish before we reach Columbus. Really, Mr. Treadwell, if you intend to honor me with the presidency I would suggest you postpone the meeting with your Consulting Engineer so I can handle the whole matter in my official capacity."

* * * * *

"WASN'T that George Jurdine I saw getting off the car ahead?" asked the Consulting Engineer, as he greeted Treadwell and Volker on the station platform.

Volker: "Yes, it was, and he's surely a live wire. I'm for him 100% for president."

"What! George Jurdine. Why, his high production costs were always the joke of the engineering world. Back East where his disgraceful plant equipment sunk the Empire Chemical Company, he was known as old F.O.B. Jurdine."

Treadwell: "What's that about F. O. B.?"

Consulting Engineer: "His mind starts and stops with the price on a car. 'Foolish Old Bunk, we called it. He can't understand that everything in a plant should be bought 'R. W. U.' as somebody once said of him."

Treadwell: "I never heard of 'R. W. U.'"

Consulting Engineer: "Right When Used! As regards piping, that means materials which permit quick installation at low cost, and a finished system economical to run and easy to maintain. For such a system you need to buy every item 'R. W. U.'—bends, fittings, hangers, welded nozzles, all 'Right When Used'."

Treadwell: "I see it. That was the failing of our old President. We are paying for his 'hard buying' in the expensive modernizing of this comparatively new plant."

Volker: "I *don't* see it. As our Consulting Engineer you're responsible for final performance and when our own men do the work you will be able to spot and reject imperfect materials."

Consulting Engineer: "That's thoroughly impractical; virtually impossible, unless you want to cramp production for a year. No. 'Right When Used' is the only safe yardstick; and always means to me the Grinnell Company. As you know, they have installed more finished piping equipments than any other firm in the world. Since they sell in the open market the very same fabricated material, fittings and hangers that they use in their own work, you can be sure that those materials are right when used."

* * * * *

For further information address Grinnell Company, Inc., 280 W. Exchange St., Providence, R. I.

GRINNELL COMPANY

Automatic Sprinkler Systems | Steam & Hot Water Heating Equipment | Humidifying and Drying Equipment | Fittings, Hangers and Valves | Pipe Bending, Welding, etc. | Power and Process Piping

Furnishing Materials from Engineering Specifications a Specialty

George E. Dahlquist, Carl H. Dahlquist, Theodore S. Dahlquist, all of Dedham, Mass.; Arthur J. Duhamel, Boston, and Howard V. Foulke, Belmont, Mass.

Phillips Htg. Co., Boston, Mass., capital $10,000. Incorporators: William Wilbur Phillips, 6 Beacon Street, Boston, and Louise R. Staab.

H. L. Claeys & Co., Warren, Mich., capital $100,000, to incorporate their heating, plumbing and hardware business.

Riordan Plumbing Supply Co., 7 Passaic Ave., Harrison, N. J., capital $100,000, to deal in heating and plumbing supplies.

New Way Steam Co., capital $50,000, to manufacture heating specialties. Incorporators: L. E. Henning, D. D. Merrill and S. W. Way.

Tripple Oil Burner Co., Seattle, Wash., capital $50,000. Incorporators: G. D. Tripple and Thomas H. MacLachlan.

U. S. Ventilating Corp., West Warwick, R. I., capital $100,000. Incorporators: Raymond A. Geoggrey, Thomas Robert, Albert J. Rene, Omar Lavigne, Jean M. Legris, Joseph Hebert, all of Arctic, R. I., and William G. Forcier.

Wilmington Oilomatic Heating Co., Wilmington, N. Y., capital $100,000, to deal in oil-heating specialties.

Sherman Oil Burner Co., Sherman, Texas, capital $6,000, to manufacture a new oil burner for domestic use. Incorporators: C. J. Sherman, R. L. Jacobs and Ewing Werlin.

Ferguson Oil, Heat & Engineering Co., St. Louis, Mo., capital $50,000, to manufacture oil and gas burners. Incorporators: Thomas B. Ferguson, Louis Wallrapp and Jacob W. Kisling.

Baker Oil Burner Sales Co., Seattle, Wash., capital $10,000. Incorporators: C. H. Williams, W. H. Mankey, and M. L. Brandt.

Sword Oil Co., Boston, Mass., capital $10,000, to engage in a general heating business. Incorporators: F. H. Andres, and J. O. Conlin.

Lucas Heating Systems, Inc., 525 West 103rd St., Chicago, Ill., capital $25,000, to manufacture and deal in heating systems. Incorporators: C. B. Rosenberg, Glenn O. Lucas and George M. Illges.

A. T. Oil Burner Co., Boston, Mass., capital $100,000. President, Sinius M. Hansen; treasurer, Carl A. Olsen, 16 Archer Street, Lynn, Mass.; secretary, Julian P. Beek.

New Firms and Business Changes

William J. Miskella, M. E., Chicago, Ill., announces the opening of an office and laboratory at 1164 West 22nd Street, Chicago, where he will specialize as consulting engineer on lacquer, japan and enamel-finishing problems. Mr. Miskella is the president of the Lamberson Japanning Company.

Robert J. Anderson, Met. E., D. Sc., Pittsburgh, Pa., offers a general consulting engineering service in the metallurgy production and application of aluminum and aluminum alloys. He has opened offices at 221 Amber Street, E. E.

Heatvent Engineering is the name under which B. M. Halpern, M. E., of New York, will conduct an engineering and contracting business in heating and ventilation. Mr. Halpern has opened offices at 15 Park Row, New York. In addition to heating and ventilating work, he will specialize in air conditioning and drying. Manufacturers catalogues are desired.

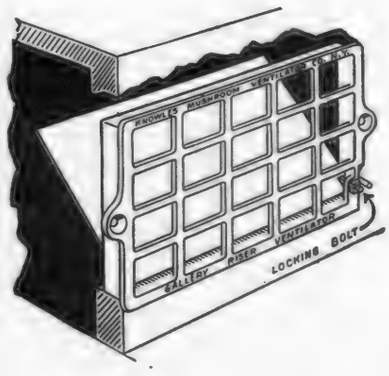
Schley & Nash Co., Pittsburgh, Pa., announces the opening of a branch office in Youngstown, O., at 1101 Realty Building under the management of L. A. Burch and E. Walter Meyer.

Klein Heating Co., engineers and contractors, St. Louis, Mo., announce the removal of its quarters to 4209 Olive Street. Walter A. Klein is the president of the company.

Wolff & Munier, Inc., New York, announce the acquisition of the good-will, equipment, records, plans and specifications of Walker & Chambers, one of the long-established heating and ventilating contracting firms of New York. In an announcement of the change, it is stated that Wolff & Munier, Inc., will occupy the building at 222 East 41st Street, where Walker & Chambers have been located since 1909.

Knowles Gallery Riser Ventilator

ADJUSTABLE



SIZE	A	B	C	D	E	AREA Sq Ft	CFM V 300	LBS. WT.
6	7 5/16	4 5/8	7 3/4	4 3/4	1/4	.196	60	2
8	9 5/8	6 3/8	10 1/4	6 3/4	1/4	.349	105	4
10	11 5/8	7 5/8	12 3/4	8 3/8	5/16	.545	165	6 1/2
12	16 3/8	10 3/4	17	11 1/8	1/2	.785	235	9 1/2

A Device which is helping to solve the hitherto perplexing problem of Gallery Ventilation

Before specifying the ventilators on your next theatre or auditorium installation, be sure you are familiar with the KNOWLES Gallery Riser Ventilator.

This type of ventilator is used for the intake or exhaust of warm or cool fresh air in threatre, church or school auditoriums. It is helping to solve the question of gallery ventilation, which has long been a perplexing problem.

The damper is adjustable to any desired opening and locked so that it cannot be tampered with.

Let us tell you more about the KNOWLES Gallery Riser Ventilator.

Knowles Mushroom Ventilator Co., 202 Franklin St., New York

Makers of the famous "Notch" Mushroom

These Days Are Gone Forever

If you want to know how to get rid of the expansion tank nuisance in your hot water installations—just ask your jobber about Mueller's **tankless** Automatic System of Water Heat Control. By this better, safer, no more costly method of control, thousands of plumbers have made life easier for themselves—at the same time they have done their customers a favor.

Note the diagram below—it shows **everything** that is needed. There is no overhead open tank or closed basement tank to handle and install. This is a Mueller development—a Mueller reducing valve combined with a Mueller relief valve and a positive, automatic draft and damper regulator. The water is supplied automatically. Safety relief is automatic.

Write for details and ask your jobbers for particulars—kiss the old expansion tank goodbye!

Distributed by Leading Jobbers Everywhere

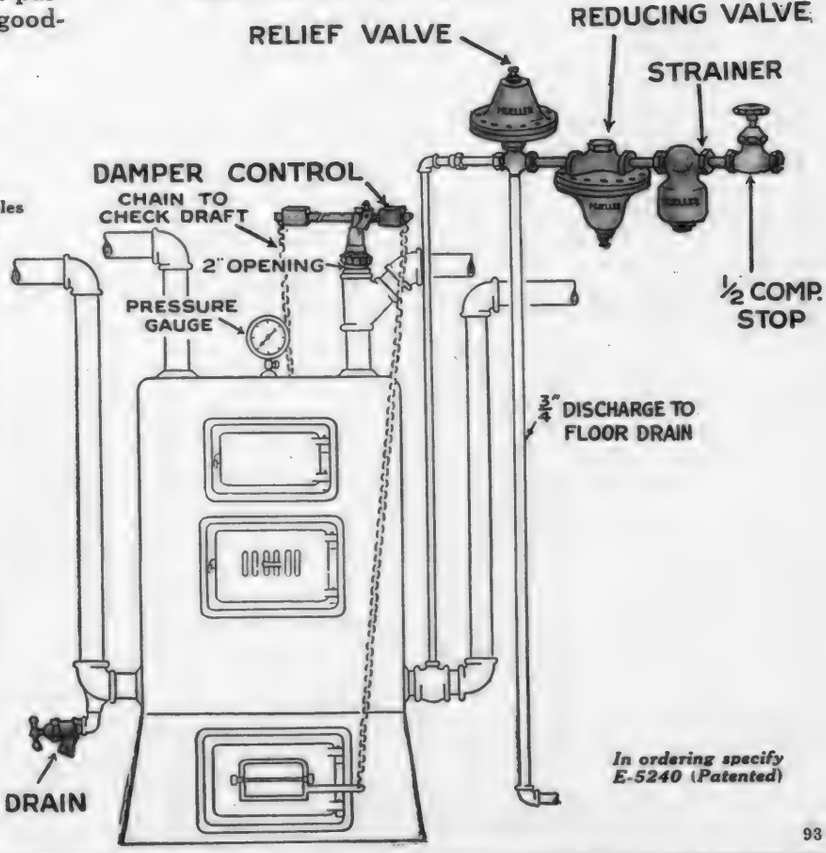
MUELLER CO.

(Established 1857)

Factories: Decatur, Ill., Port Huron, Mich.
Branches: New York, San Francisco, Los Angeles
Canadian Factory: MUELLER, Ltd., Sarnia

Mueller Automatic Hot Water Heat Control

1. No expansion tank, either open or closed.
2. Quickly installed on either new or old jobs.
3. Water in system always fresh.
4. Rapid circulation, due to pressure and fresh water.
5. Entirely automatic as to supply, relief and damper regulation.
6. A very considerable saving in fuel, due to automatic control of dampers and rapid circulation.
7. Perfectly safe, as both reducing valve and relief valve are operated by the pressure of the water in the system.
8. The reducing and relief valves are positive in action and durable, the working parts being made of bronze with phosphor bronze diaphragms.
9. The boiling point of water raised to higher point than with the open system.



In ordering specify E-5240 (Patented)

ALBANY PARK HEATING COMPANY

Steam, Vapor, Hot Water, Heating and Ventilating
3218 Montrose Avenue
Chicago

Mueller Co.,
Decatur, Illinois

Gentlemen:

Your advertising in the trade papers on your heating system has attracted my attention and I thought perhaps you would be interested to know that we put our O. K. 100% on what you say about it.

Any up-to-date heating contractor who investigates the advantages of a heating system like yours over the old closed tank or open tank system will soon be won over to Mueller. One beauty about your proposition is that it doesn't cost the property owner a cent more to install this system when he is building. From our standpoint it requires less labor and gives us a nice profit on every system that we put in.

Sincerely yours,
John Schroeder,
Albany Park Heating Company.

WANTED

Advertisements under this heading, $2.00 per inch, payable in advance. A 1-in. advertisement contains 35 words. To secure insertion copy must be received not later than the 20th of the month preceding date of issue.

PATENT AND PROTECT
Your valuable inventions
and
Register your trade marks.
Prompt attention. Superior Service
Lester L. Sargent, Patent and Trade Mark Attorney.
524 10th Street, Washington, D. C.

SALES ENGINEERS WANTED—Thoroughly capable and qualified sales engineers, familiar with vacuum and vapor heating appliances. Preference given to one having experience with established manufacturers of such products. In reply state thoroughly all facts related to your experience, salary wanted, etc., which will be treated in confidence. Address Consolidated Steam Specialty Co., Milwaukee, Wis.

FACTORY FACILITIES—Middle West manufacturer requires 6000 sq. ft. floor space near New York City, preferably northern New Jersey, for manufacturing sheet-metal products. Can use machinery having capacity for No. 10 gauge and lighter. Advise location, rental and machinery available. Address Box 91, care of Heating and Ventilating Magazine.

EXPERIENCED SALESMEN by a prominent manufacturer of cast-iron boilers and radiators. Liberal compensation and splendid opportunities for advancement. Openings in several sections of the country. In reply, state age, education, experience and present employer. Address Box 85, care Heating and Ventilating Magazine.

REPRESENTATIVES WANTED for several territories, for part time. Must be able to sell to heating contractors doing theatre work. Improved pattern floor vents. Address Box 92, care Heating and Ventilating Magazine.

MANUFACTURED WEATHER
makes
"Every day a *good* day"
Humidification · Dehumidification
Heating · Ventilation · Purification
Drying
Carrier
Engineering Corporation
750 Frelinghuysen Ave Newark, N. J.
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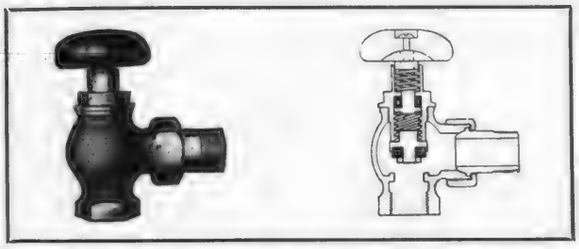
SEE OUR DETAILED DATA IN ASH&VE GUIDE



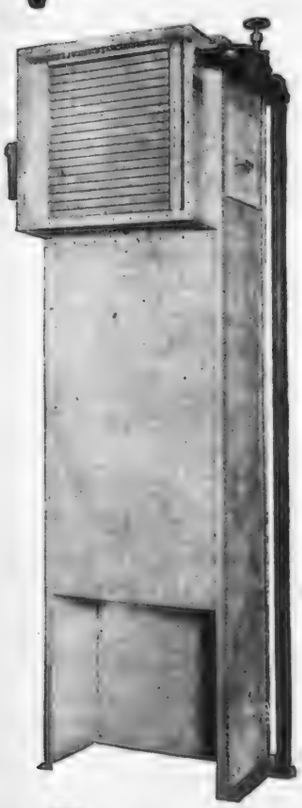
"Stay-Rite" Line
No. 1—PACKLESS VALVE
The distinctive feature of the Stay-Rite Radiator Valve is its packless construction. Spring tension exerts pressure with the steam. Tightness of packless feature is not dependent upon spring tension, as steam or water pressure will keep packless discs tight even without the spring. Another outstanding feature is that Jenkins disc seat is perfectly aligned with valve seat, allowing valve to be closed tight without excess pressure.
Stay-Rite Valve is quick-opening, only one-half turn necessary to fully open or close. Area of valve opening and also lift are full size, giving extra large capacity. Ruggedly constructed and all that the name implies. Fully guaranteed.
Let us tell you more about Stay-Rite Heating Specialties.
The Ideal Heating Equipment Co.
1250 West 4th Street CLEVELAND, OHIO

Buckwheat and Rice can be Burned under Heating Boilers
instead of the domestic sizes of coal
saving $5 to $7 per ton
by installing
Wing Type E M Equipment

Less ashes
Less labor
More efficient heating
The first cost will be returned in less than a year.
Now is the time to equip your boiler.
Ask for our Bulletin 26-A
L. J. WING MFG. CO.
Hudson and 13th Streets, New York, N. Y.

In what Other Heating Method can you get these amazing Advantages?

The Venturafin METHOD OF HEATING



1. More than 5 times the heating efficiency of direct radiation.
2. One-tenth the weight of direct radiation.
3. One-fourth the space of direct radiation.
4. Much less time to install than direct radiation.
5. Positive heat in the most severe weather.
6. Even distribution of heat.
7. The ability to heat up more quickly than direct radiation.
8. Adaptable to practically any position without loss of efficiency.
9. Considerably less heat loss through walls than direct radiation.
10. Low cost of installation.
11. Considerable saving in fuel.
12. The minimum of maintenance costs.
13. Copper and brass coils, non-corrosive, non-breakable.
14. Portability without great expense.
15. Ventilation as well as heating.
16. No alterations to install.
17. Applicable to practically any heating need without special construction of units.
18. Practically indestructible.
19. Simplicity.
20. Ease of control.

Write for Complete Data

AMERICAN BLOWER COMPANY, DETROIT
BRANCH OFFICES IN ALL PRINCIPAL CITIES
CANADIAN SIROCCO COMPANY, LIMITED, WINDSOR, ONTARIO

(464)

American Blower

"Sirocco" TRADE MARK

VENTILATING, HEATING, AIR CONDITIONING, DRYING, MECHANICAL DRAFT

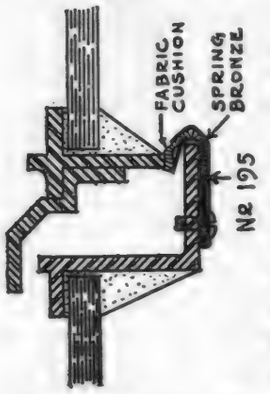
Manufacturers of all Types of Air-Handling Equipment — Since 1881

Drafts, dust—even noise—can't "sneak through"

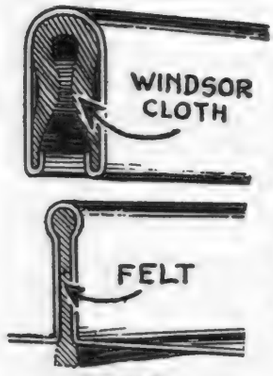
Athey (Pat'd)

Cloth-Lined Metal Weatherstrip

[The only weatherstrip that can be successfully applied to either wood or metal sash]



Athey Cloth-Lined Metal Weatherstrip for drawn steel windows. Notice the cloth and spring bronze contact. This strip is recommended by leading manufacturers of steel sash as the one practical and efficient weatherstrip made.



Double Size

Athey Cloth-Lined Metal Weatherstrip for wood sash. The cloth-to-metal contact keeps out all drafts, dust and noise, yet is sufficiently pliable so the windows can be opened easily.

Athey Products — See our catalogue in Sweets

Perennial Window Shades Disappearing Partitions
Skylight Shades Cloth-Lined Metal Weatherstrips

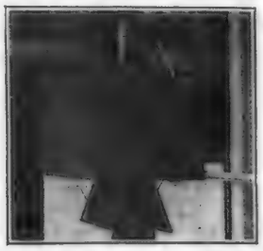
Write for complete information and prices

Athey Company

6097 West 65th Street · Chicago, Illinois

In Canada: CRESSWELL-McINTOSH, Reg'd.
270 Seigneurs St., Montreal, Que.

WING FEATHERWEIGHT UNIT HEATERS



for FUEL CONSERVATION

Wing Featherweight Unit Heaters effect a direct saving in fuel as compared with old methods of industrial plant heating.

Suspended from the ceiling or roof structure, they take air from the overhead spaces and deliver it, properly heated, directly to the working levels; thus preventing the accumulation of excessive heat overhead, where it serves no useful purpose.

Further, a considerable economy is obtained through the ease with which the heat may be turned on or off. The mere pull of a switch starts or stops the heat. Contrast this with direct radiation, where numerous valves must be operated—it is easier to open windows and let the heat out.

Wing units are compact, light, and easily and cheaply installed. May we send bulletin?

L. J. Wing Mfg. Co.

Fans and Blowers *Damper Regulators*
Unit Heaters *Small Turbines*
Hudson and 13th Sts. NEW YORK

AIR CONDITIONING TRADE MARK

APPARATUS for maintaining artificial atmospheric conditions in industrial plants.

ATMOSPHERIC CONDITIONING CORPORATION
LAFAYETTE BLDG.
PHILADELPHIA

For VENTILATION use LYON Toad Stools

They are Vent Caps of great strength, unobstructed throat, rigid non-rattling construction. The adjustment is from full open to full closed. The height of the floor member prevents sweeping dust and refuse into them. Their efficiency and economy make them particularly adaptable for theatres, auditoriums, etc.

Send for table of capacities and velocities. Prices etc

LYON PRODUCTS CO., Inc.
7 So. Dearborn St.
CHICAGO ILLINOIS

This is THE Unit Heater

Wherever unit heaters are practical—to supplement an existing heating system, or for a new building, the Buffalo "BREEZO-FIN" Heater is the one you want.

It's light and compact, but very strong.

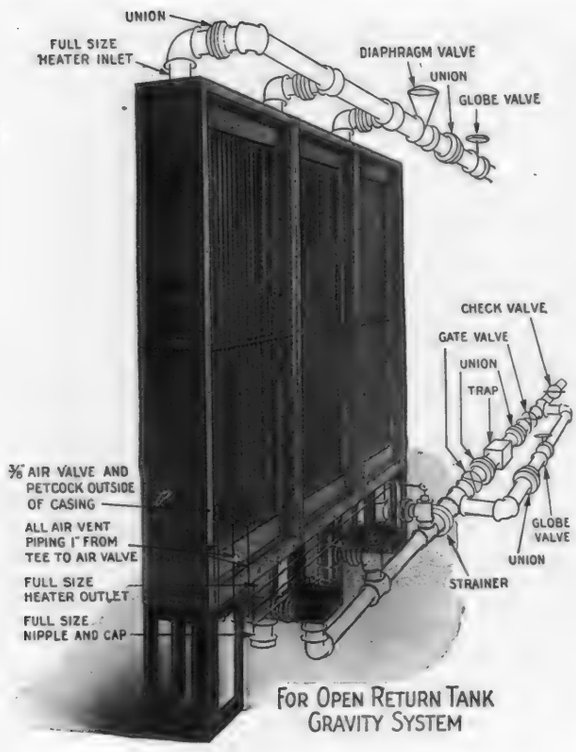
The heater tubes are of copper, wound with thin ribbons of copper that multiply the heating surface of the tubes. The housing is heavy galvanized iron. The fan is the Buffalo Breezo—a silent, efficient outfit with totally enclosed silent motor, having waste packed bearings which require oiling only once every 3000 hours.

Made in 18 and 24" sizes, these units can be placed anywhere, connected up to the steam and electric lines in a few minutes, and require practically no attention all winter. Their low first cost is maintained by inexpensive operation. If you're going to install any heating equipment, tell us what you're going to heat and let us tell you the cost of

"Buffalo" BREEZO-FIN HEATERS

BUFFALO FORGE COMPANY

480 BROADWAY, BUFFALO, N. Y.



FOR OPEN RETURN TANK GRAVITY SYSTEM

AEROFIN CORPORATION
750 Frelinghuysen Avenue
Newark, N.J.
L. C. Soule, *Sec'y and Chief Engineer*

AEROFIN

Fan-System Heating Surface

To Engineers, Architects and Contractors

THREE YEARS OF SUCCESSFUL SERVICE demonstrates that AEROFIN has established itself as a dependable product.

ENGINEERS OF NATIONAL REPUTATION AND TWENTY YEARS' EXPERIENCE WITH FAN SYSTEM HEATERS, are responsible for the design, development, manufacture and marketing of AEROFIN, and their services are at your command to assist you in working out your heating, ventilating, cooling and drying problems.

SINCE THERE IS NO EQUAL TO AEROFIN, WHY NOT SPECIFY IT OUTRIGHT? Plans and specifications should show sizes and number of units, with piping details.

AEROFIN HAS A TREMENDOUS ADVANTAGE in its LIGHTWEIGHT. AEROFIN weighs only 9% to 25% as much as the old-fashioned heavy heaters. AEROFIN SAVES A GREAT DEAL OF SPACE.

AEROFIN IS MADE OF NON-CORROSIVE METALS. This feature meets with universal approval.

THE INSTALLED COST OF AEROFIN IS GENERALLY LESS than that of cast-iron heaters and pipe coils. AEROFIN (completely encased) can be erected in the same number of HOURS as is required in DAYS to erect the heavy heaters. This means a great saving in erecting cost.

THE INSTALLATION OF AEROFIN WITH VERTICAL TUBES IS RECOMMENDED as this arrangement is less subject to errors of installation and operation. THE HORIZONTAL TUBE ARRANGEMENT is satisfactory when installed in accordance with our instructions and diagrams.

Write for catalog, instruction leaflet and service details.

Aerofin is Sold ONLY by Manufacturers of Nationally Advertised Blower Heating Apparatus.

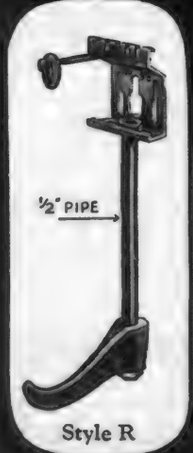
E-Z RADIATOR HANGER

YOU'LL USE 'EM YET!

Compare with any other hanger and you will see why the E-Z HANGER is the easiest to install.

Write for ALL the advantages.

HEALY-RUFF CO.
772 Hampden Ave.,
St. Paul - - Minn.



Style R

The Original Boiler Designed Especially for Oil Burners

BREESE Burn Oil Boiler

Four years of wide distribution has proven the efficiency of its improved construction.

The heat goes to the job, not up the stack.

Write for Bulletin A-1
Dealers Territory Open

BREESE ENGINEERING CORPORATION
341 EAST OHIO STREET
CHICAGO, ILL.

NEW RITCHIE SCHOOL, WHEELING, W. VA.
Architects, Chas. W. Bates *and* F. F. Faris, *Associate*, Wheeling, W. Va.
Heating Contractor, Barnes & Clark, New Castle, Pa.

This New Grade School Building is Now Being Equipped with Forty-four Buckeye Heatovents

ARCHITECTS and builders everywhere are enthusiastic about the appearance of the Buckeye Heatovent.

It is finished with the same care and workmanship as any fine piece of furniture or expensive automobile. The Buckeye Heatovent, unit system of heating and ventilating, is made in any finish and will harmonize with the interior of your particular building.

Upon request we will send you an illustrated booklet giving full information about the Buckeye Heatovent.

Buckeye Heatovents incorporate the latest and best engineering principles and are constructed of the very highest class materials and workmanship. These features, together with that intangible asset "Buckeye Service" insure your clients against poor ventilation and future repair bills.

Full description and detailed drawings are to be had in our data book for architects and engineers, available on request. But our complete service includes, also, that of co-operation on the part of members of our engineering staff, who will consult with you on your heating problems.

Our new catalog is now ready. Write for your copy now.
Any of our Branches can supply you.

BUCKEYE BLOWER CO.

COLUMBUS, OHIO

Branch Offices:

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Rose Building, Cleveland, Ohio.
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1011 Pioneer Trust Co. Building, Kansas City, Mo.
1400 Broadway, New York, N. Y.
1236 Callowhill St., Philadelphia, Pa.
709 Columbia Bank Building, Pittsburgh, Pa.
210 Dooly Building, Salt Lake City, Utah.
405 Sharon Building, San Francsco, Cal.
Fales Building, Seattle, Washington.
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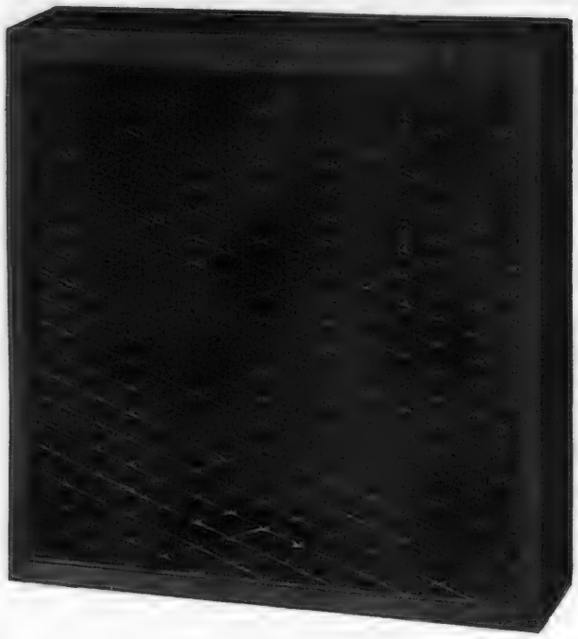
1101 Realty Building, Youngstown, Ohio.

TANG L DUST
TRADE MARK REGISTERED



The Tangldust Filter Gets 97% of the Dirt

It has a lower average resistance than any filter made.

A simple washing leaves the filter as clean as the day it was installed.

Sent free on request

This bulletin on Tangldust Air Filters fully describes their construction and operation.

Cooling Towers—Air Washers—Spray Systems

The Cooling Tower Co., Inc.
NEW YORK

Branches in Principal Cities.

YOUR own best advertisement is an installation which saves money for the owner. Insure satisfaction by installing Davis Pressure Regulators to reduce boiler steam pressure to most economical pressure for heating purposes.

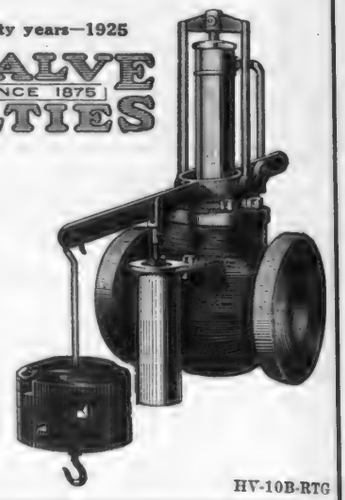
G. M. DAVIS REGULATOR CO.
436 Milwaukee Avenue
Chicago, Ill.

1875—Valve makers for fifty years—1925

DAVIS VALVE SPECIALTIES
STEAM SAVERS SINCE 1875

Davis Pressure Regulator

Piston type, with counterweighted lever control. Pressure is balanced by weight. Action is visible, and may be tested by moving lever. No springs or toggles—no diaphragms to give way.



HV-10B-RTG

CALOROIL
ECONOMY DEPENDABILITY RELIABILITY SIMPLICITY
THE CALOROIL BURNER
BURNERS

Heating Engineers endorse Caloriol Burners because of their Simplicity, Reliability and Efficiency.

Automatic Fuel Oil Burning equipment suitable for:

RESIDENCES	SCHOOLS	GARAGES
APARTMENT HOUSES	CHURCHES	LAUNDRIES
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	GREENHOUSES	OVENS

Caloroil Burners are approved by the Underwriters' Laboratories maintained by the National Board of Fire Underwriters and by the Board of Standards & Appeals, New York City.

Let us send you literature and full details.

CALOROIL BURNER CORP.
5 East 40th St. New York City

Radiator Brackets

York Wrought Steel Radiator Brackets will save you money in installing radiators, for no wall strips are required. Brackets fasten with lag screws or expansion bolts, and oval bolt holes allow adjustment for leveling or pitching. They are the lowest priced brackets on the market.

Twelve sizes carried in stock. Write for catalog, prices and discount

York Heating & Ventilating Corp.
1506 Locust Street, PHILADELPHIA

Clean Air for Hotels

The practical hotel man has had ample experience with dust, and the annoyance and damage it causes. He does not have to be convinced that his hotel needs clean air.

This fact, coupled with the widespread appreciation on the part of engineers and architects, of what Midwest Air Filters accomplish in supplying clean air, explains the rapidly increasing list of Midwest installations, in both large metropolitan hotels and those in smaller cities. We might mention, amongst recent orders:

THE BOOK-CADILLAC, DETROIT, MICH.
THE EMERSON, BALTIMORE, MD.
THE KENMORE, BOSTON, MASS.
THE PARK AMERICAN, KALAMAZOO, MICH.
THE INDIANA, HAMMOND, IND.
THE ANDROY, SUPERIOR, WIS.

If you are working on any hotel ventilating jobs now, let us show you what Midwest Air Filters can do.

Write Dept. F4 and ask our local engineer to call.

Midwest Range Filters

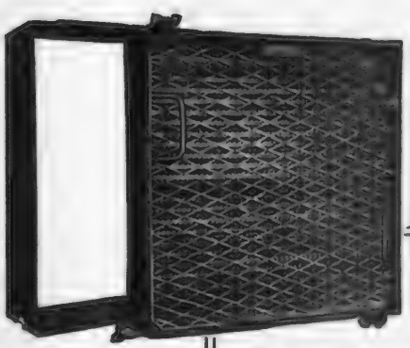
A special type of Midwest Filter for installation in the hoods over kitchen ranges in hotels, restaurants, clubs, etc., for the purpose of collecting grease fumes and preventing fires in the flues.

They are extensively installed, notably in the Wm. Penn and Fort Pitt Hotels of Pittsburgh, the Statler of Buffalo, and the Pennsylvania, of New York.

MIDWEST AIR FILTERS
INCORPORATED
100 EAST 45TH STREET
GRAND CENTRAL TERMINAL BLDG.
NEW YORK, N.Y. U.S.A.

Midwest Canada Limited
83 Craig St., West
Montreal, Canada

Midwest Air Filters Pacific, Inc.
Monadnock Building
San Francisco, California



The New Model Type U2 Filter

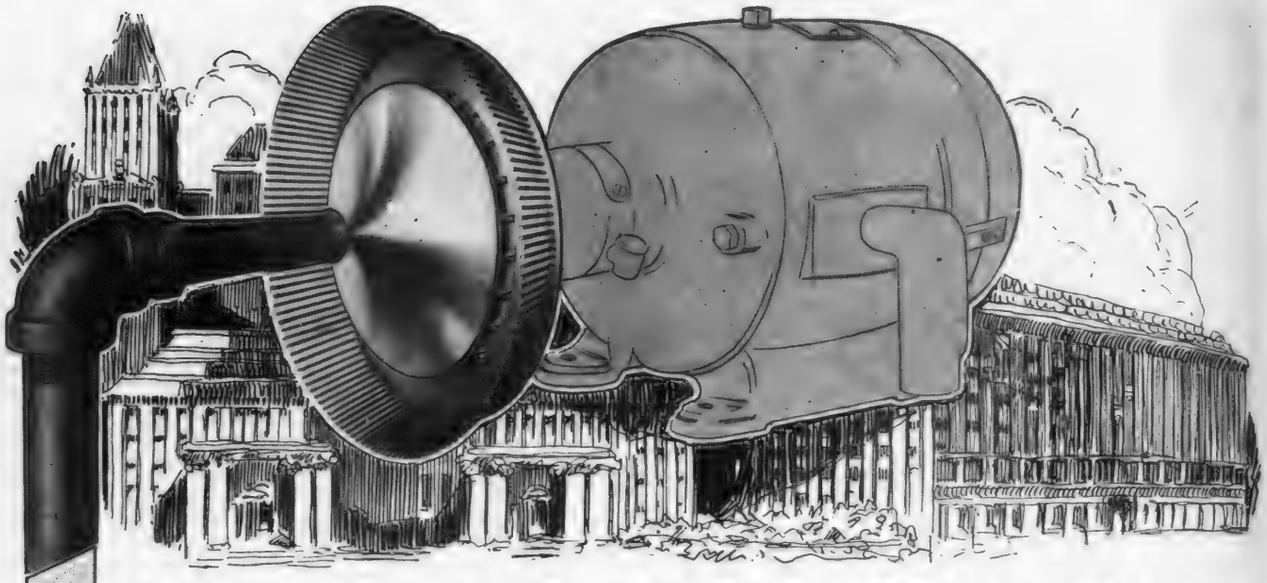
An installation is built up of standard interchangeable units, (a frame and filter cell 20" x 20" x 6½" overall, with a capacity of 800 C.F.M. per unit.) A positive air-seal is provided between each cell and frame and between adjoining frames on all sides.

The unique Midwest baffle-impingement principle makes these filters the most efficient air cleaners in existence. The filter medium consists of a series of specially shaped and perforated metal sheets coated with a sticky viscous fluid. Dusty air in passing through the filter cell, is forced to change its direction innumerable times.

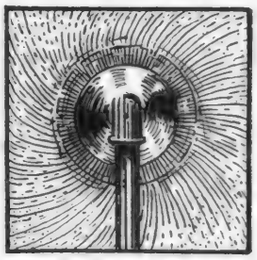
Dust particles are impinged against the sticky surfaces of the filter sheets, where they are caught and held.

A series of specially designed sheets of knitted metal mesh are provided at the rear portion of the cell, on which fine dust particles which might pass the first filter sheets are impinged and caught.

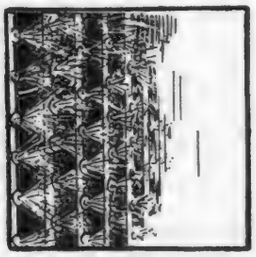
Midwest Air Filters do not clog up. Any one cell of an installation requires cleaning once every 6 to 8 weeks. With routine cleaning a constant resistance of ⅜" water gauge is maintained. With this performance is coupled a cleaning efficiency unsurpassed by any other filter on the market.



The Bayley Air Washer Saves Power!



The Bayley Turbo Air Washer will not clog, needs no pump screen, and requires only nominal water pressure. It churns the water centrifugally into a dense even spray.



The high pressure, multiple nozzle air washer requires water at high pressure screened at the pump and the fine orifice nozzles easily become clogged.

BECAUSE it is based on a new, revolutionary principle in air washers, the Bayley Turbo Air Washer operates at a water pressure of from 75 to 90% lower than the usual high pressure system which requires from 10 to 30 lbs. per square inch water pressure. This reduction in water pressure results in a power saving of from 40 to 60 per cent. In addition to this power saving the Turbo Air Washer saves the repair and maintenance costs of clogged nozzles, a common trouble with the multiple nozzle spray system of washing air. The Bayley Air Washer will not clog because it has no fine orifice nozzles; a simple, large, fire type nozzle delivers the water to the spray wheel where it is whirled into a dense curtain of spray through which no impurities can pass.

Non-clogging and economical in operation—these are the features that make the Bayley the most efficient air washer available today. Write for Bulletin No. 25 giving the complete facts.

BAYLEY MANUFACTURING COMPANY

742 GREENBUSH ST., MILWAUKEE, WIS.

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INDUSTRIAL DRYING SYSTEMS

Sturtevant Silentvanes are the ideal fans for ventilation!

Sturtevant Silentvanes represent the greatest development in ventilating fans and are the choice of a great many architects and engineers because they give such remarkable results. In a large number of the country's most prominent buildings these fans are meeting all ventilating requirements successfully.

Silentvanes embody many desirable features among which are the ability to run at high speeds, high efficiency, and quietness of operation. But these are not the only salient points that make Silentvanes so popular.

The self-limiting horse power characteristic saves power and prevents motor overload. With this important feature it is no longer necessary to provide a motor with a horse power capacity so much greater than the fan load requires in operation. Therefore, a considerable saving on motors is also realized.

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Silentvanes & Sturtevant Air Washers in Bowery Savings Bank, 42nd St. & Park Ave., N. Y. C.—York & Sawyer, Arch.—Frank Sutton, Cons. Eng.—Johnson & Morris, H. & V. Cont.

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NOW! you can increase efficiency

And make your business show added profits

The loss of time, the uncomfortable, displeased working force, which is the result of a poorly equipped heating system is the prime reason for many a man's balance sheet showing loss instead of gain.

"PECCO" Heating Systems have solved these problems for Factories, Garages, Halls, etc., where spaces of large cubic contents require extraordinary heating equipment. The solution of your heating problems is a specialty of our engineers whose years of study and practical experience have made them 100% proficient. All of these "PECCO" extends to you as a part of its most excellent service.

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Write today for Catalog showing some representative "PECCO" installations.

A Scientific Method of Burning Coal and Coke

Any heating engineer who is interested in saving coal and getting more heat for himself or for his clients can test the CROWN Fuel Saver at small expense.

Write for full details of this wonderful coal-saving device and for low demonstration price. We have such absolute confidence in the CROWN that we guarantee to return every penny of the small purchase price if the CROWN does not make

A coal-saving of at least 20%

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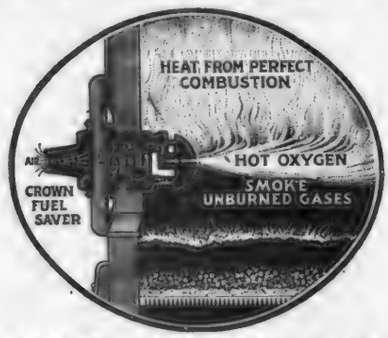

CROWN FUEL SAVER

and SMOKE *Consumer*

Fits the Feed Door of Any Heating Plant

American S & B Instruments

reduce manufacturing costs, eliminate spoilage, and increase efficiency. They are the result of over 75 years' experience in solving problems of temperature, pressure speed, etc.

Write for Text Book N-14

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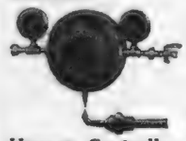

Honeco Controller

American S & B Pressure Gauge

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A worth-while Bulletin on Temperature Regulation Just off the Press

If you want to know the RIGHT way, the most economical way, to regulate temperatures, write for this new bulletin. Thorough and authoritative. Should be in every engineer's library. Bulletin No. 6.

ATLAS VALVE COMPANY
REGULATING VALVES FOR EVERY SERVICE

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REED AIR IS CLEAN AIR

The above illustrations show one of the Schrafft Restaurants in New York City and (left) the Reed Air Filter installation that cleans 30,000 C. F. M. of air for its ventilation. Send today for any or all of the bulletins on Reed Air Filters listed on coupon below.

SCHRAFFT Serves Thousands Daily with Reed Clean Air

Schrafft has set new standards for the hurried meal. He has invested the rush luncheon with an air of refinement and comfort. Delicious food daintily served in attractive surroundings. Reed Air Filters are helping by furnishing—even during the rush hours—clean, fresh, wholesome air in abundance, thus insuring the comfort and health of patrons, the protection of fine equipment and the lowering of upkeep costs. Write us today.

REED AIR FILTER CO., *Incorporated*
215 Central Avenue, Louisville, Kentucky
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REED AIR FILTER COMPANY, Inc.
215 Central Avenue, Louisville, Ky.

Gentlemen: Please send me without obligation the following bulletins:

No. 106—The Reed System of Air Filtration
No. 107—Data, Tests and Specifications
No. 108—Reed Air Filters for General Ventilation

Possible use ..... C. F. M. Required
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Name .....
Address .....

Reed Air

TRADE **filters** MARK
ALL METAL

(*REED AIR FILTERS* are manufactured under patents of May 16, 1922, Feb. 12, 1924, Nov. 18, 1924. Other patents pending.)

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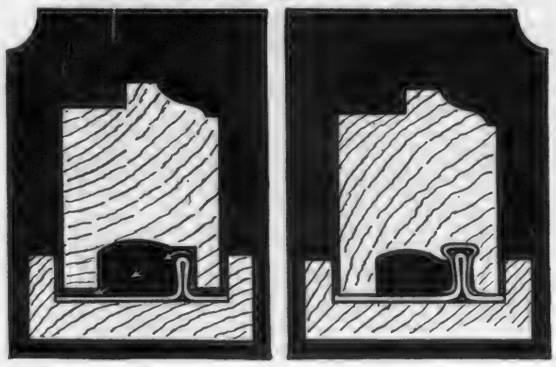
WEATHER STRIPS



Ordinary single-member strip
Sash grooved for cord

The exclusive Higgin Insert
Strip completes the job

Are you recommending the right weather strips?

The only weatherstrips made with a self-holding spring-flange **Insert** are Higgin All-Metal Weatherstrips.

No window without this **Insert** can be as draft-tight as a Higgin-equipped window. The illustration shows why.

The spring flanges of the **Insert** lightly grip the sides of the raised rib and close the space around the sash at every point. There is no air leakage where the sash is cut out for the cord, nor seepage around the rib when the sash shrinks. The metal-to-metal contact insures a perfect fit and closure; also an easy-sliding sash under all conditions.

A Higgin Installation means added comfort, greater fuel saving, increased satisfaction with the heating system.

HEATING ENGINEERS! You can safely guarantee a definite heating efficiency for your equipment when Higgin All-Metal Weatherstrips are installed. They keep all the cold air out and all the warm air in. They never lose their close fit by warping or shrinkage of frames. Every job is installed by trained Higgin men and guaranteed by the Higgin organization. Recommend Higgin All-Metal Weatherstrips to your customers.

The HIGGIN Mfg. Co.
Newport, Ky.
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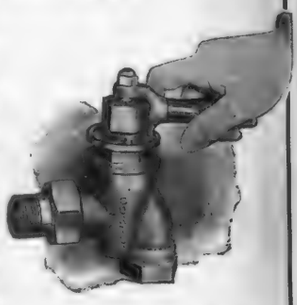
Manufacturers of Higgin All-Metal Weatherstrips and Higgin All-Metal Screens

GORTON VALVES

1920-1925

In 1921

Mr. A. P. Walters, General Superintendent of McCormick & Co., largest manufacturers of spices, etc., of Baltimore, Md., wrote as follows:



"We have about 400 Gorton Quarter Turn Packing Lock Valves in actual operation on the radiators in our building. They are giving us the best service.

Our heating system carries a vacuum from 11" to 13" and although we have run the heating plant about a year, we have had no trouble whatever. *The valves are in A-1 condition.* We are more than glad to recommend them to the use of anyone in the market for radiator valves." (*Floor space of building 12 acres.*)

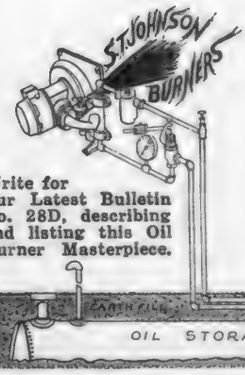
On August 10, 1925, Mr. Walters writes:
"The information given in 1921 *holds good today."*

Details of the Exclusive Features of This Quality Valve Gladly Furnished

Gorton & Lidgerwood Co.
96 Liberty Street, New York, N. Y.
Established 1887 Representatives in Principal Cities

Improved Rotary Type 22

This cut shows a complete installation of Underground Oil Storage Tank-Piping and Johnson Improved Rotary Oil Burners. Note—How Simple—and Safe. Can be readily installed in most any Boiler Heater or Furnace. Patented features of Centrifugal Atomization permit the cheapest grade Fuel Oil to be pumped and burned with high economy and satisfactory service—Listed as standard by Underwriters' Laboratories.



Write for Our Latest Bulletin No. 28D, describing and listing this Oil Burner Masterpiece.

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The adjustable deflector on Ilgair Unit Heater is covered by Patent No. 1,295,151

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It IMMEDIATELY oxidizes odoriferous gases, vitalizes and freshens the air in precisely the same way as is accomplished in Nature.

FRESH AIR FREE FROM ODORS, is essential to true COMFORT.

OZONIZED AIR IS FREE FROM ALL ODORS, IT IS FRESH, PURE AND VITALIZED.

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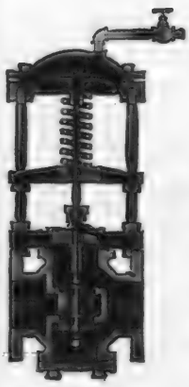

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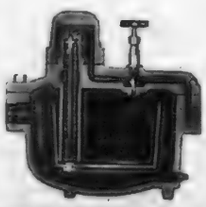
This illustration shows a Rockaway Pressure Reducing Valve, one of the various types we manufacture. Other types, lever weighted, pilot piston operated and hydraulic operated.



Steam Traps, Bucket and Ball Float Types. All Pressures.

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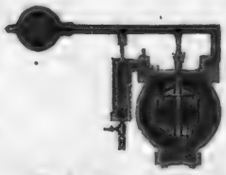

Back Pressure Valves, Noiseless Type, Spring or Lever weighted. Sizes 2" to 30"

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Vapor Heating

assurance doubly sure when tied to the boiler with a

Wiley Safety Vent Vapor Regulator

Write for your copy of booklet describing the Wiley line of vapor heating specialties.

peerless quality product manufactured and sold exclusively by

The Simplex Heating Specialty Co.
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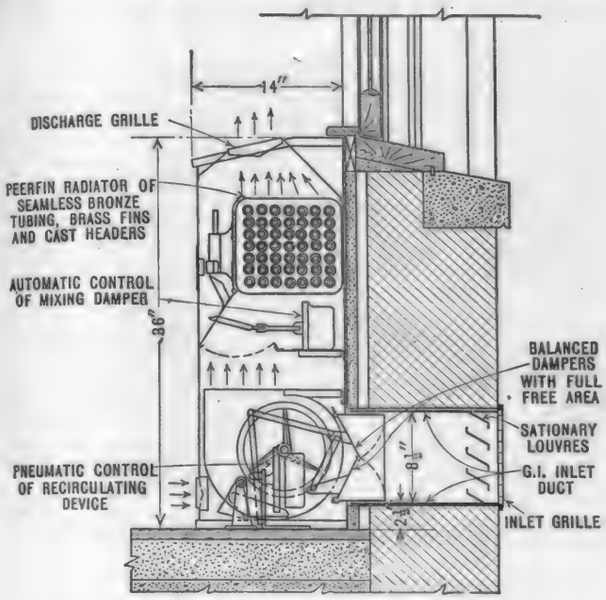

PeerVent Heating and Ventilating Unit with Automatic Control

PEERVENT

Heating and Ventilating Unit

Improved!

There is a general tendency toward the use of low-type heating and ventilating units.

The improved PeerVent Unit incorporates in a smaller cabinet all the features of the larger type units used in the past.

The PeerVent is just as easy to regulate as the older units.

Concealed Type PeerVent Unit

Only 36 inches high; does not interfere with windows or obstruct light. Fourteen inches deep; minimum obstruction in aisle next to windows. Equipped with the Peerfin Radiator, the most efficient radiator ever developed for ventilating units.

Has all advantages of older types of Peerless Units: Independent service for each room. Thorough ventilation without drafts. Noiseless operation. Adaptable to all steam systems. Easy to operate. Always in working order. Big cost and space savings. Easy to install. No remodeling required for old buildings.

Our new Catalogue will soon be ready. Send your name and you will get one of the first ones off the press.

PEERLESS UNIT VENTILATION CO., Inc.

Skillman Avenue and Hulst Street, Long Island City, N. Y.

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PEERLESS

UNIT SYSTEM

Heating and Ventilating

How Close Can You Guess the Labor Cost of a Big Industrial Heating Job

OF course, you don't guess at labor costs. But is the average estimate on a big complicated job much better than a guess? How often have you seen a comfortable margin of profit wiped out by labor conditions that could not be foreseen.

What can you do about it?

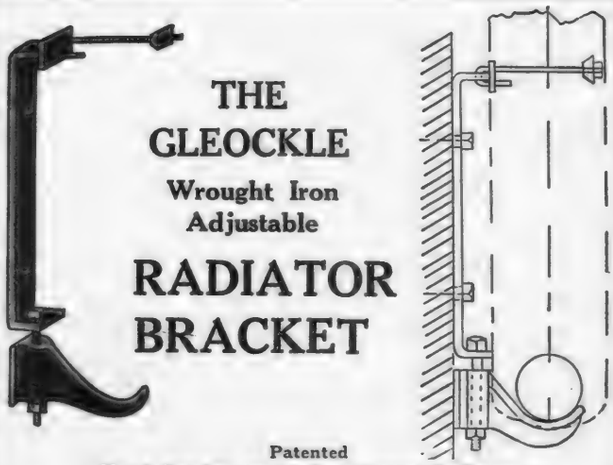
You can recommend to your customers a system that minimizes labor. For instance, the big assembly shop pictured here would have required 10,000 sq. ft. of direct radiation. Imagine the labor to install that amount of radiation in a building of this type. But, there were actually installed only six TWINFAN unit heaters. You can't go far wrong on the cost of connecting up six units. And the building is heated better and at less cost than with direct radiation.

This TWINFAN system is in use by hundreds of leading industrial concerns throughout the country. Every installation is designed by thoroughly competent engineers.

Refer your next factory heating inquiry to us.

DWYER EQUIPMENT COMPANY
4534 W. NORTH AVE. CHICAGO, ILL.

THE GLEOCKLE
Wrought Iron Adjustable
RADIATOR BRACKET



Patented
No. 9 Bracket for Legless Column Radiation

Bound to Meet Requirements

In specifying Gleockle Wall Radiator Brackets you can be sure they will meet all requirements. They are carefully designed and constructed to fit any make of wall radiator, are adjustable, sanitary, indestructible, and easy to erect. They are specified where the best of equipment is required.

FIT ANY MAKE OF WALL RADIATOR

Send for descriptive booklet and trade discount

A. F. GLEOCKLE, Jr.
415 Bay Street Rochester, N. Y.

Experienced dealers prefer
The Sun Oil Burner

1. *Quiet-Dependable*
2. *Easily Installed*
3. *Simple to Operate*
4. *Brings a good Profit*

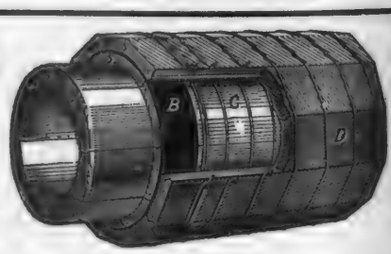
An almost perfect score on installation of Sun Oil Burners. Out of some 15,000 equipments sold, we know of only two that have ever been altered. Thermostatic control without pilot, because of dependable low flame adjustment. Can be installed in five to eight hours by one man. Natural draft or power.

Company backed by Woods Bros., who enjoy highest rating given by Dun or Bradstreet.

Write for full facts and special dealer's proposition.

HEAT EQUIPMENT CORP.
133 S. 13th St., Lincoln, Neb.

Wyckoff's Improved Cypress Covering



Lasts as Long as The Pipe Itself

As well as being highly efficient in its application, Wyckoff Improved Cypress Steam Pipe Covering withstands all conditions attending steam pipe trenches. All engineers who know Wyckoff Pipe covering specify it because it lasts.

A. WYCKOFF & SON CO. ELMIRA, N. Y.

The NATIONAL ROTARY Automatic AIR FILTER

An Apparatus

1. That embodies only proven mechanical principles simply combined.
2. That cleans the air more thoroughly than has heretofore been considered practical, and
3. That operates continuously with machine-like precision and eliminates the labor required by existing equipment.

A Filter That Cleans the Air and then Cleans Itself

Bulletin "A" fully describes this important development in filter design and gives capacities, dimensions, etc. Send for your copy now.

NATIONAL AIR FILTER CO.
CHICAGO
9 South Clinton Street

Engineers pronounce it, "The most advanced step ever taken in the science of air filtration."

COUPON

NATIONAL AIR FILTER CO.,
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Chicago, Illinois.

I am interested in clean air. Please send me your Bulletin A, describing the new National Rotary Automatic Air Filter.

NAME .....

ADDRESS .....

3190

Patented

"Master Control" Valve

New Thermostat makes possible a simplified construction

The Automatic Switch Control Box is now made a part of the motor bracket unit, because the new Thermostat being suitable for contacting on either 110 or 220 volts direct no low voltage transformer is required.

Armored cable is used to connect thermostat to motor switch, making this installation most desirable in Industrial Buildings, Stores, Offices, Schools, Hospitals, etc.

The method of construction heretofore used will be continued, for use in such places as residences, where the running of armored cable might be less desirable than that of the low voltage thermostat cord.

Either style of "Master Control" is sold on a sixty days' trial basis.

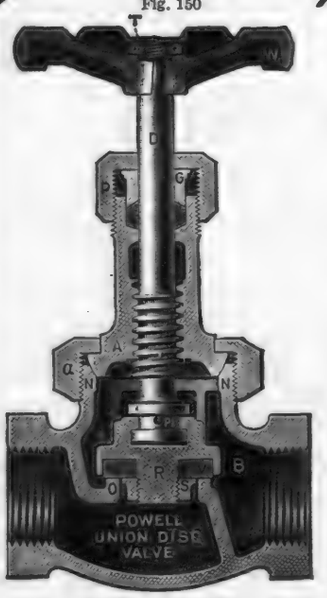
Ask for Bulletins and complete information about this efficient heat controlling system.

Heat Loss is Money Loss

Central Heat Appliances, J. C Hornung Engineer **343 So. Dearborn St., Chicago**

POWELL VALVES

Fig. 150



Sizes ⅛ to 3 inches

UNION COMPOSITE DISC VALVES

ALWAYS DEPENDABLE

For Hot Water or Steam Heating

Notice the Union Bonnet Connection

Ask your dealer for Powell Valves

The Wm. Powell Company
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High Grade Self-Improvement Home Study Course in

Gravity Steam and Water Heating

(by Mail)

Covering Fundamentals of Heating—Hot Water Heating Systems—Radiators and Radiation—Gravity Steam Heating Systems—Hot Water and Steam Boilers—Cost Estimates

Written, prepared and handled by

Ara Marcus Daniels, Consulting Engineer

Woodward Bldg. **Washington, D. C.**

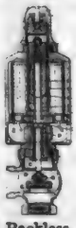
ASK ABOUT COURSE HB **NOT A SCHOOL**

(Formerly A-EM-DEE Engineering Co.)

AUTOMATIC

HEAT REGULATION

ELECTRICALLY OPERATED



Packless Electric Valve

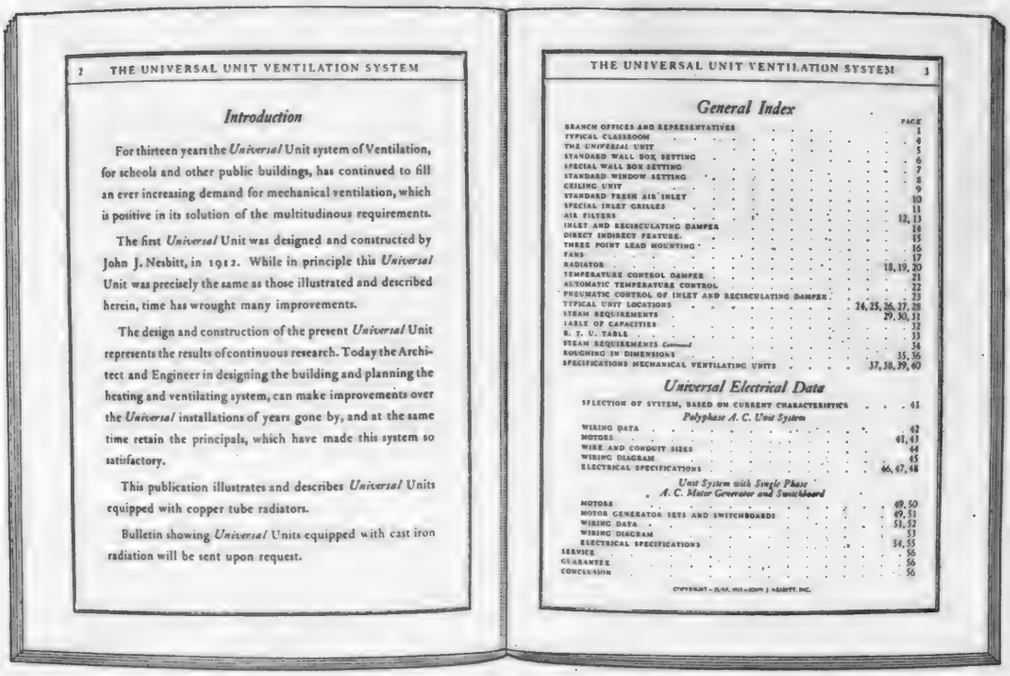
Whether it be for an isolated room or complete building, Gold's Control will give you that desired equable temperature. Energy derived from the 110 volt lighting current.

Thermostat

Write for General Catalog with Testimonials

GOLD CAR HEATING & LIGHTING CO.
BUSH TERMINAL
220 36th STREET **BROOKLYN, N. Y.**

The Universal Unit Ventilation System



2 THE UNIVERSAL UNIT VENTILATION SYSTEM

Introduction

For thirteen years the *Universal* Unit system of Ventilation, for schools and other public buildings, has continued to fill an ever increasing demand for mechanical ventilation, which is positive in its solution of the multitudinous requirements.

The first *Universal* Unit was designed and constructed by John J. Nesbitt, in 1912. While in principle this *Universal* Unit was precisely the same as those illustrated and described herein, time has wrought many improvements.

The design and construction of the present *Universal* Unit represents the results of continuous research. Today the Architect and Engineer in designing the building and planning the heating and ventilating system, can make improvements over the *Universal* installations of years gone by, and at the same time retain the principals, which have made this system so satisfactory.

This publication illustrates and describes *Universal* Units equipped with copper tube radiators.

Bulletin showing *Universal* Units equipped with cast iron radiation will be sent upon request.

THE UNIVERSAL UNIT VENTILATION SYSTEM 3

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THIS miniature reproduction of the introductory page and index gives an idea of the importance of the contents of the new Universal Unit Catalog and Engineers Data Book. Replete with data, tables, section drawings and photographs reproduced in black and colors, the catalog is unique as a reference book on Unit Ventilation. It is completely indexed, printed on heavy stock, bound to stand the wear of frequent use, and sized to fit your file.

Where Shall We Send Your Copy?

JOHN J. NESBITT, Inc.

Executive Office & Factory

213 NORTH VERMONT AVENUE

ATLANTIC CITY, N. J.

Branch Offices & Representatives

NEW YORK CITY

MINNEAPOLIS, MINN. ST. PAUL, MINN. PORTLAND, ORE.

DULUTH, MINN. DENVER, COLO. SEATTLE, WASH.

What Can Foxboro Instruments Give That You Haven't Got?

Foxboro Indicating and Recording Instruments enable Heating and Ventilating Engineers to direct and conserve the physical forces of temperature, pressure and humidity.

Boilers will steam and all the complex equipment for heating and ventilating office buildings, banks, institutions, etc., somehow can be made to work without the aid of Foxboro Instruments.

But economies of operation and the health and comfort of the consumer cannot be absolutely assured unless Heating and Ventilating Engineers have at their finger tips the exact knowledge that these instruments alone can give.

Their cost is one of the least of the necessary items of equipment expense.

The savings they make possible have a tremendous effect upon your profits.

Foxboro Instruments are built with scientific exactness. Their accuracy is guaranteed. They have demonstrated their ability to render this great service to Heating and Ventilating Engineers for more than a quarter of a century.

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Neponset Avenue, Foxboro, Mass., U. S. A.

New York Chicago Boston Philadelphia Pittsburgh
Cleveland Rochester Birmingham Tulsa
Los Angeles San Francisco Portland, Ore.

FOXBORO
REG. U. S. PAT. OFF.
THE COMPASS OF INDUSTRY

TRADE MARK
BRISTOL'S
REG. U. S. PAT. OFFICE

Accurate Record Means Close Control

The closeness with which temperature may be controlled depends first upon the accuracy of the method employed for measuring and recording the temperature.

Write for Catalog N-1303

Bristol Records make possible the closest kind of control for they are accurate.

The Bristol Company *Waterbury, Connecticut*
FOR 36 YEARS — Ask Any Technical Engineer — MAKERS OF
BRISTOL'S RECORDING INSTRUMENTS

"Safety Valves"

The selection and installation of equipment in buildings and plants involves careful consideration and execution and represents thousands of dollars. Why not give serious thought to the protection of that equipment against loss by fire?

C. S. B.
Approved Sprinkler Heads

meet the emergency. They are the "Safety Valves" of a sprinkler system and can be depended upon to respond when needed, with a surety that fire will be extinguished immediately and effectively.

Write us for prices and details. We cooperate with you in every way.

C. S. B. SPRINKLER CO.
54 Batterymarch St., Boston, Mass.
Factory: Laconia, New Hampshire
Canadian Representatives: L. E. Moulton Co., Inc., 142 Inspector St., Montreal, Can.

JAMES M. SEYMOUR

LAWRENCE STREET, MECHANIC STREET AND KIRK PLACE
NEWARK NEW JERSEY U. S. A.

ESTABLISHED—1888

PRICE LIST

SPECIAL AEROPLANE BLADE AUDITORIUM FANS

	Single Fan	Twin Fans
48 inch	$125.00	$225.00
54 inch	150.00	275.00
60 inch	175.00	325.00
72 inch	225.00	400.00
84 inch	275.00	500.00
96 inch	325.00	600.00
108 inch	400.00	750.00
120 inch	475.00	900.00

Send for Bulletins and Discount

LIBERAL DISCOUNTS ALLOWED TO RESPONSIBLE DEALERS

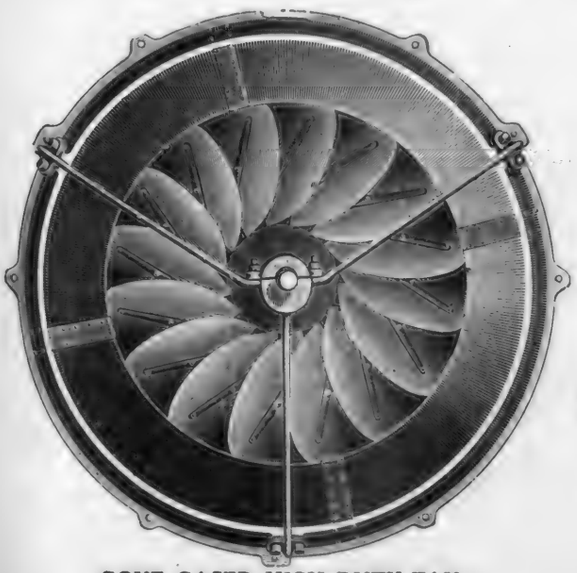
SEYMOUR PATENT FANS

RIGID SQUARE FRAMES—ALL STEEL
HYATT ROLLER BEARINGS

AUDITORIUM FANS are made in all sizes from 48″ to 120″ to fit any square opening, no matter what size. For example: Should you order a 63½″ fan the price will be that of a 72″ or the next larger size on the list.

SEYMOUR FANS are sold subject to a substantial discount from this price list. Furnished with suitable pulley or coupling for direct connection.

TWIN FANS include shafting and center bearing.



CONE CASED HIGH DUTY FAN

Special Fans for Cooling Towers, Heating Systems, Induced Draft, Forced Draft, Dry Rooms, Dry Kilns.

A Complete line of Leather Drying Apparatus.

Send for Bulletins

STEEL DRY ROOMS
DRYING TUNNELS

KENNEDY

Heavy Globe and Angle Valves

Fig. 91

THESE valves are very strong and substantial, being made heavy in all their parts and of the best quality metal. They have an unusually large passageway for steam or fluids.

The stems are of special bronze of 50,000-lb. tensile strength. The discs are made of a special composition, the compressibility of which causes it to conform to uneven surfaces and make a perfectly tight joint with the seat. The valves are furnished with a gland and can be repacked under pressure.

One of the big Kennedy line of 4600 different types and sizes described in Catalog 45 which will be sent on request.

THE KENNEDY VALVE Mfg. Co. ELMIRA, N.Y.

Branch Offices and Warehouses
NEW YORK: 128-132 White St.
SAN FRANCISCO: 448-450 Tenth St.
BOSTON: 47 India St.
CHICAGO: 228 N. Jefferson St.

Sales Offices:
SALT LAKE CITY
EL PASO
SEATTLE
KANSAS CITY, MO.
LOS ANGELES
PHILADELPHIA
MIAMI
CLEVELAND

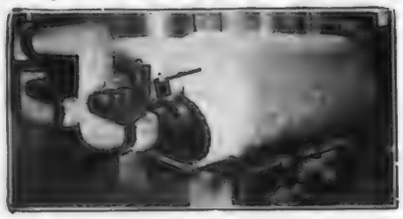
HEATING Stanwood Smokeless Boilers POWER

HEATING CAPACITY
Steam—3300 Sq. Ft. to 25,000 Sq. Ft.
Water—5200 Sq. Ft. to 40,000 Sq. Ft.

NO MUD LEGS OR STAYBOLTS
LOW STACK TEMPERATURES
LOW WATER LEVEL—RAPID CIRCULATION

The Stanwood Corporation
CINCINNATI, OHIO
Successor to
THE HOUSTON STANWOOD & GAMBLE CO.

ALBERGER BUFFALO HEATERS



Alberger Heaters are known the country over for efficient heat transmission, unusual accessibility and reliable service.

ALBERGER HEATER CO. 291 Chicago St.
HOWARD IRON WORKS Buffalo, N. Y.

Brownell Return Flue Portable Heating Boiler—Smokeless Type

BROWNELL

Better Boilers for Heating and Power Purposes
70TH YEAR

of successful manufacturing experience. This is the reason why Brownell Boilers are specified by all the leading Heating and Contracting Engineers.

BROWNELL Steel Heating Boilers are
LOW IN FIRST COST
HIGH IN EFFICIENCY
BUILT TO LAST A LIFETIME

Our reputation is your insurance of a high quality product. Let us solve your heating problems. Sales representatives in all principal cities. Send for them.

THE BROWNELL CO.
DAYTON, OHIO

THE BROWNELL COMPANY The World Over SINCE 1858 DAYTON, OHIO, U.S.A.

Established 1855

Send for Bulletins B6 B6A

BOILERS

Made in boards 12 inches by 32 or 36 inches—from 1 inch to 3 inches thick.

Trade Mark

Cork Lined Houses Are Easier to Heat

THE heating system you design will be more efficient and economical to operate if the house is lined with Armstrong's Corkboard. Heat losses through the walls and roof are so reduced by the insulation that not only is the house more easily and uniformly heated, but it can be kept comfortable with from a fourth to a third less fuel.

In a cork-lined house, the added comfort derived from the heating system reflects credit on the engineer who designed it and on the contractor who installed it. You promote your own interests when you recommend Armstrong's Corkboard Insulation, for the protection it affords insures the better performance of your system.

House insulation is rapidly becoming an important factor in your business. It will pay you to know more about it.

Further information will be sent free on request to engineers and contractors interested in easier-to-heat dwellings and apartments. Armstrong Cork & Insulation Company (*Division of Armstrong Cork Company*), 202 Twenty-fourth Street, Pittsburgh, Pa. Canadian office, McGill Building, Montreal, Quebec.

One and one-half inches of Armstrong's Corkboard is equal in insulating value to a 24-inch brick wall.

Armstrong's Corkboard is strong, light and easy to handle. It is nailed against frame construction or put up in Portland cement mortar against brick, stone, concrete or hollow tile. Plaster is applied directly on the cork without lath.

Armstrong's Corkboard will not absorb moisture and does not mold, rot or provide harboring places for rats, mice or vermin. It does not warp, shrink or swell.

Armstrong's Corkboard is slow-burning and a positive fire-retardant. It does not smolder or carry fire.

Branches in the Principal Cities

Armstrong's
Nonpareil
Corkboard Insulation

for Residential, Commercial and Industrial Buildings

Divorces are Expensive!

The man who is choosing valve equipment might be compared to the young man who is about to choose a wife. Both the wife and the valve equipment must be lived with afterwards, and divorce is both undesirable and very expensive.

Valves are really important items. A valve is not merely a mass of bronze or iron with a stem and a wheel. Properly designed and constructed valves are the product of engineering skill and there is as much difference in their makeup as in the clothes that people wear.

Standardize on Scott Valves. Over fifty years of valve engineering experience is woven into the perfected Scott Valve line of today.

The famous Scott No. 1 Gate Valve

Scott Valve Manufacturing Company
3963 McKinley Avenue **Detroit, Michigan**

SCOTT SINCE 1886 **VALVES**
SIGN OF VALUE
"MAXIMUM SERVICE PER DOLLAR"

The STICKLE Thermostatic Radiator Valve

The Expansion principle in return line Radiator Traps is not novel or new. Consequently the difference in this class of Traps is in the construction.

The expansive movement of this diaphragm is fully one-quarter inch, which is much more than is necessary for opening and closing the valve. This gives a factor of safety which is greater than any valve made, consequently it requires no adjustment. May we send you our bulletin?

STICKLE STEAM SPECIALTIES CO.
INDIANAPOLIS, IND.

New York Office 46 E. 41st St.
Boston Office 52 Sudbury St.

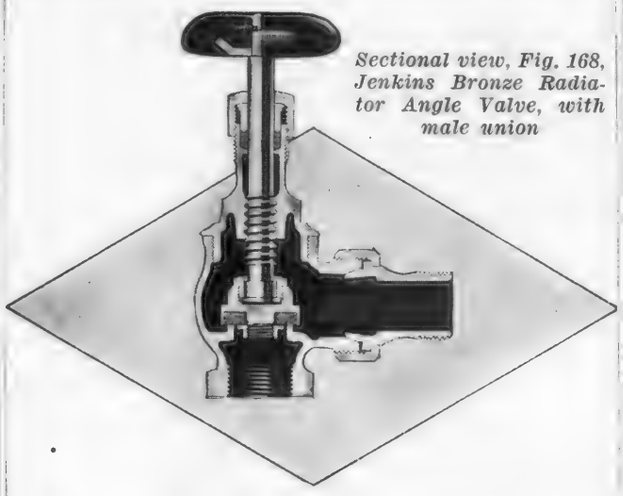
USE A MASON
Lever Style Reducing Valve
on your next
HEATING CONTRACT

Accurate Regulation
SIMPLE DESIGN
Rugged Construction

MASON REGULATOR COMPANY
Boston, Mass. San Francisco, Cal. Montreal, Canada

The Minneapolis Heat Regulator means what it says
—and thus assures you real fuel saving
THE one great purpose underlying automatic regulation of the home heating plant is to provide a constantly uniform temperature in the living room. To obtain Uniformity you must have Accuracy of Control. They are as inseparable as the Siamese twins.
Controlling devices that permit a range of three to five or more degrees, can't give you anything but guess regulation. Like a "tricky" speedometer, they never tell you the truth and are certain to cause a great deal of annoyance. Under the guise of accuracy, they win your confidence and at the same time steal from your fuel supply.
The Cost of Inaccuracy
Every degree over 70 increases the fuel consumption 3 per cent. A range of 5 degrees brings the increase to 15%. And tests prove the variation is frequently still greater.
Accuracy of control has been a guiding principle for 40 years in the manufacture of Minneapolis Heat Regulators. Every Minneapolis must be unfailing in its accuracy, never permitting a variation of more than one degree.
An accurate thermometer is attached to each Minneapolis Room Thermostat, so that you may always see how closely the Minneapolis is holding the room temperature to the degree you have set it for.
The Famous Clock Thermostat
Combined with Accuracy of control are other important factors in Minneapolis leadership. The clock-thermostat, for example, provides an automatic checking of the fire at night for comfortable sleeping, saving fuel; and rouses the fire before you wake in the morning, so you may dress in comfort. The Minneapolis principle of low voltage thermostatic control, with thermostatic metal as the actuating element, insures permanent, satisfactory service without replacement of parts, and makes it easy to install correctly in any home. Tearing out of walls, running of high voltage wires in conduit to upstairs rooms, etc., is never necessary with the Minneapolis.
The growing practice of selling certain types of heating plants already equipped with automatic controls makes it essential to know these Minneapolis advantages and to insist on them. Oil burner dealers can sell you the oil burner you choose, with Minneapolis Controls—if you demand them.
For Coal, Gas, Oil Heating
Minneapolis Heat Regulators are for every kind of heating. Write us, stating what type heating plant you are interested in and we will send free literature on the Minneapolis for that particular type.
MINNEAPOLIS HEAT REGULATOR CO.
Established 1885
2803 Fourth Ave. So.— Minneapolis, Minn.
The "MINNEAPOLIS" HEAT REGULATOR for COAL—GAS—OIL
How Accurate Control Saves
—each degree costs you 3% more fuel!
Figure your average winter's fuel bill. Then see how much each degree of heat over the temperature desired costs you. And remember, this saving is only a small part of what the Minneapolis saves for you. The automatic nightshut down, and the saving that comes from keeping an even fire amount to 1/5 to 1/3 of your total fuel cost. Minneapolis Heat Regulators are built for accuracy; that's why a thermometer is included as a part of the thermostat. The thermometer has no function in the working of the thermostat—it is there as a check only. If your Regulator doesn't function accurately you want to know it. Don't buy a heat regulator without a thermometer.
Mail coupon at right for free booklet and full information regarding automatic heat regulation—a subject you should understand thoroughly before buying ANY heating Plant.
Minneapolis Heat Regulator Company
2803 Fourth Ave. So.
Minneapolis, Minn.
Please send me your free booklet, "The Proper Operation of the Home Heating Plant," and full information on the subject of automatic heat control. I have checked below the kind of fuel I am now using or have under consideration:
☐ Coal ☐ Oil ☐ Gas
☐ Dist. Steam
Name .....
Address .....
Town and State .....
When you buy an oil burner, insist on automatic control that is accurate to 1° variation. Inaccurate control means waste and discomfort.

This full page advertisement appears in the Saturday Evening Post, Sept. 12.



Sectional view, Fig. 168, Jenkins Bronze Radiator Angle Valve, with male union

A good advertisement for a heating contractor

Fig. 180—Jenkins Right Hand Radiator Corner Valve, offset pattern, with male union.

Fig. 173A — Jenkins Radiator Offset Globe Valve, with male union.

Equipment of the known reliability of a Jenkins Valve is good advertising for any heating, piping or plumbing contractor. In keeping his work at its best, it is keeping his reputation at its best, free from the possibility of unjust criticism.

Jenkins Valves for heating service remain unaffected by the strains which play havoc with light-weight poorly-constructed valves. Every genuine Jenkins has the strength to withstand pipe expansion and contraction, or lifting and settling.

A Jenkins Valve is always ready to uphold your work. Be sure your men are using valves marked with the Jenkins "Diamond."

JENKINS BROS.

80 White St.....New York, N. Y.
524 Atlantic Ave.....Boston, Mass.
133 No. Seventh St., Philadelphia, Pa.
646 Washington Blvd...Chicago, Ill.

JENKINS BROS., LIMITED
Montreal, Canada London, England

Always marked with the "Diamond"
Jenkins Valves
SINCE 1864

2 IMPORTANT Features

Which Make the Commonwealth-Lavigne a Better Valve to use

THE new "knobby-grip" handle and the forged brass tail nut are two individual features of Commonwealth-Lavigne Radiator Valves which recommend this line to every careful buyer.

The new handle design gives a graceful appearance to the valve and makes easy heat regulation possible without burning or soiling the fingers—a point which has an instant appeal to the user.

The advantages of the forged brass tail nut are readily appreciated by every steamfitter. This tail nut is twice as strong as the ordinary casting and eliminates installation delays caused by cracked or broken tail nuts.

Commonwealth-Lavigne Radiator Valves on every installation means satisfaction to all concerned.

Your Jobber Can Supply You

COMMONWEALTH BRASS CORPORATION
DETROIT, MICHIGAN

COMMONWEALTH
LAVIGNE
RADIATOR VALVE

Pyrobar will save you coal pile dollars

Building authorities say they see them every day—plants using only the most efficient machinery, yet heat leaks through their roofs like water runs through a sieve. The trouble is that one doesn't see the heat escaping.

Isn't it high time, with fuel prices going up, to check this waste? A Pyrobar roof deck will do it. Pyrobar Tile are made of gypsum and hence have a higher insulation value than any other fireproof building material. Many engineers figure that Pyrobar, compared with a 3-in. thickness of concrete, saves up to 2 tons of coal a year for every 1,000 sq. ft. of roof area.

Besides making your coal pile dollars do more work in winter, Pyrobar Tile help keep buildings cool in summer. They are easily erected. Now is the time to act. Write today for our new booklet, "Pyrobar Roof Tile for Industrial Buildings."

U.S. PYROBAR ROOF TILE

UNITED STATES GYPSUM COMPANY

World's Largest Producers of Gypsum Products

General Offices: Dept. M, 205 West Monroe Street, Chicago, Illinois

"Keeping Others In Hot Water"—

for
Hotels, apartment buildings, hospitals, Y. M. C. A. buildings, schools and laundries

Special Attention Given to Installations Requiring Large Quantities of Hot Water, with Live or Exhaust Steam as the Heating Medium.

—may be a pastime for some folks, but for the Sims Company it is a serious proposition—a matter requiring a thorough knowledge of hot water requirements.

A long study of these requirements enables us to offer heaters that assure constant and efficient hot water service.

Engineers feel safe in specifying "SIMS" because they know it means **reliability**—a service you want to render your client.

SIMS CLEAN E-Z STEAM TUBE STORAGE HEATER

Our Engineers will gladly confer with you, without obligation, on your hot water problems.

THE SIMS CO.

Erie, Pa.

A good place to live, to work and to play.

Installed So Long Ago That Even the Name was Forgotten

WHEN the power plant foreman of one of the country's largest railroad systems wished to use expansion joints in a new installation, he immediately thought of some Wainwright Expansion Joints which has been in service in his plant for over 16 years. However, they had required so little attention, and been so long a part of the plant, that he no longer remembered the name of the manufacturer, and was forced to write the following letter:

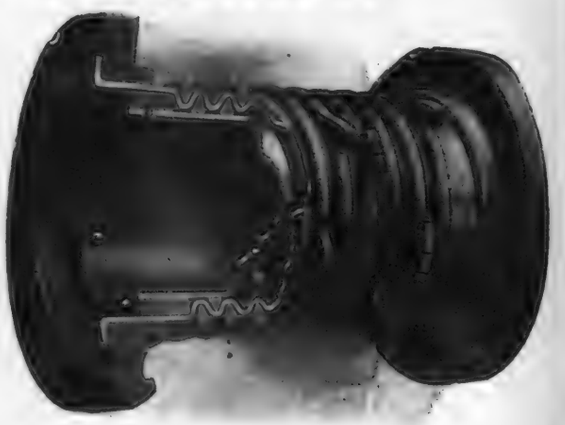
"POWER PLANT ENGINEERING,
537 South Dearborn St.,
Chicago, Ill.

Attention—Advertising Dept.

Gentlemen:

We have in our plant and shop, several expansion joints the same as figure 6 shown on page 588, of the June 1 'Power Plant Engineering.' I wish to requisition several of these joints, but have been unable to find out the manufacturer's name. For some time back, I have been looking through the advertising columns of your paper, and would appreciate it if you can give me the name of the manufacturer of these joints so that I may be able to requisition a number of these joints. Thse joints have been in service at this point for 16 years, and the performance of same during that time has been so satisfactory that I desire to use same on an installation I have in mind.

Yours very truly,"



Wainwright Improved Expansion Joint

IF you wish to know more of an expansion joint that gives uninterrupted service without attention or repairs, write for bulletin H-46.

WHEELER CONDENSER & ENGINEERING CO.

149 Broadway, New York

Works - CARTERET, N.J., NEWBURGH, N.Y.

33

"It's Off My Mind for Good"

"Hot water used to be one of my pet bugbears, but since I've standardized on **National** Storage Heaters I forget all about it, except when some tenant mentions the good service or the superintendent points out the fuel savings.

"The **National** is so dependable, economical and easy to maintain that it ought to be in every building."

Ask for Bulletin 65.

NATIONAL
U BEND TYPE
STORAGE HEATERS

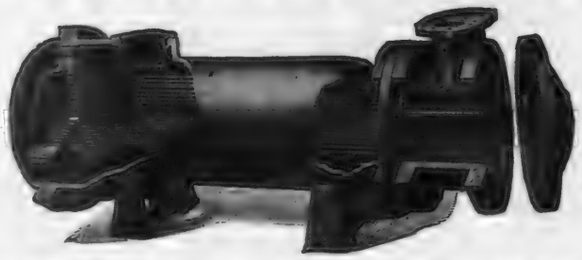
The National Pipe Bending Company

120 RIVER STREET — *Established 1883* — NEW HAVEN, CONN.

Canadian Sales Representative: Grant E. Cole Company, Toronto, Ont. 8436

Hot Water *Instantly*

Any quantity, any temperature



For Hotels, Apartments, Laundries, etc.

G-R Instantaneous Heater

for any given pressure drop, has a higher rate of heat transfer than any other closed water heater on the market.

Overload capacities possible with only slight reduction in final water temperature.

Minimum external dimensions for any desired rating.

The Griscom-Russell Co.

2155 West Street Building, New York

Philadelphia	Chicago	St. Louis	San Francisco
Boston	Detroit	Kansas City	Los Angeles
Rochester	Cleveland	New Orleans	Seattle
Pittsburgh	Indianapolis	Charlotte	Salt Lake City
Columbus	Milwaukee	Houston	Denver
	Minneapolis	Dallas	

For Canada: Riley Engineering & Supply Co., Ltd., Toronto

Send the Coupon for full information

THE GRISCOM-RUSSELL CO.,
2155 West Street Bldg., New York City.

Gentlemen:—
Please forward immediately a free copy of your information leaflet on the G. R. Instantaneous Heater.

Name.....
Firm.....
Address.....

H&V 9-25

Backed by the Prestige of 45 Years

Not every product that engineers recommend has the prestige of a firm established that long—a big, substantial concern that will stand back of you in every way.

Patterson
Hot Water Heaters

must be right because we could not afford to make them otherwise. Our reputation *must* be maintained.

When you specify the "Patterson" you are sure they will give all the hot water that can be used, as hot as desired and as quickly as it can be drawn. This we *guarantee.*

Your judgment is backed further by the endorsement of over 50,000 engineers, architects and owners.

Write for our interesting booklet.

The Patterson-Kelley Co.
107 East 40th St.
NEW YORK CITY

Further Evidence of Merit

The Rockwood Sprinkler Co. of Illinois, another 10-year user of **PHILLIPS SPRING HAMMER DRILLS**, is now drilling approximately

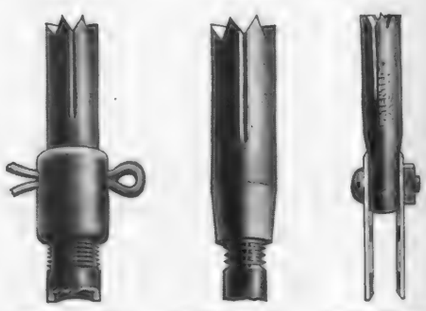
20,000 HOLES
IN CONCRETE CEILINGS

on various Automatic Sprinkler Installations.

The Automatic Sprinkler Companies are the world's largest drillers of Upward Holes in concrete, and naturally in equipping for the work, economy and dependability are main considerations in selecting tools. They are practically all users of Phillips Drills.

Recommended to heating, sprinkling, plumbing, electrical, millwrighting and general contractors, as the most satisfactory tool for drilling **UPWARD HOLES** in concrete ceilings and through floors.

Typical way of drilling holes upward in concrete ceilings and through floors. Also installing **SELF-DRILLING EXPANSION SHELLS.**

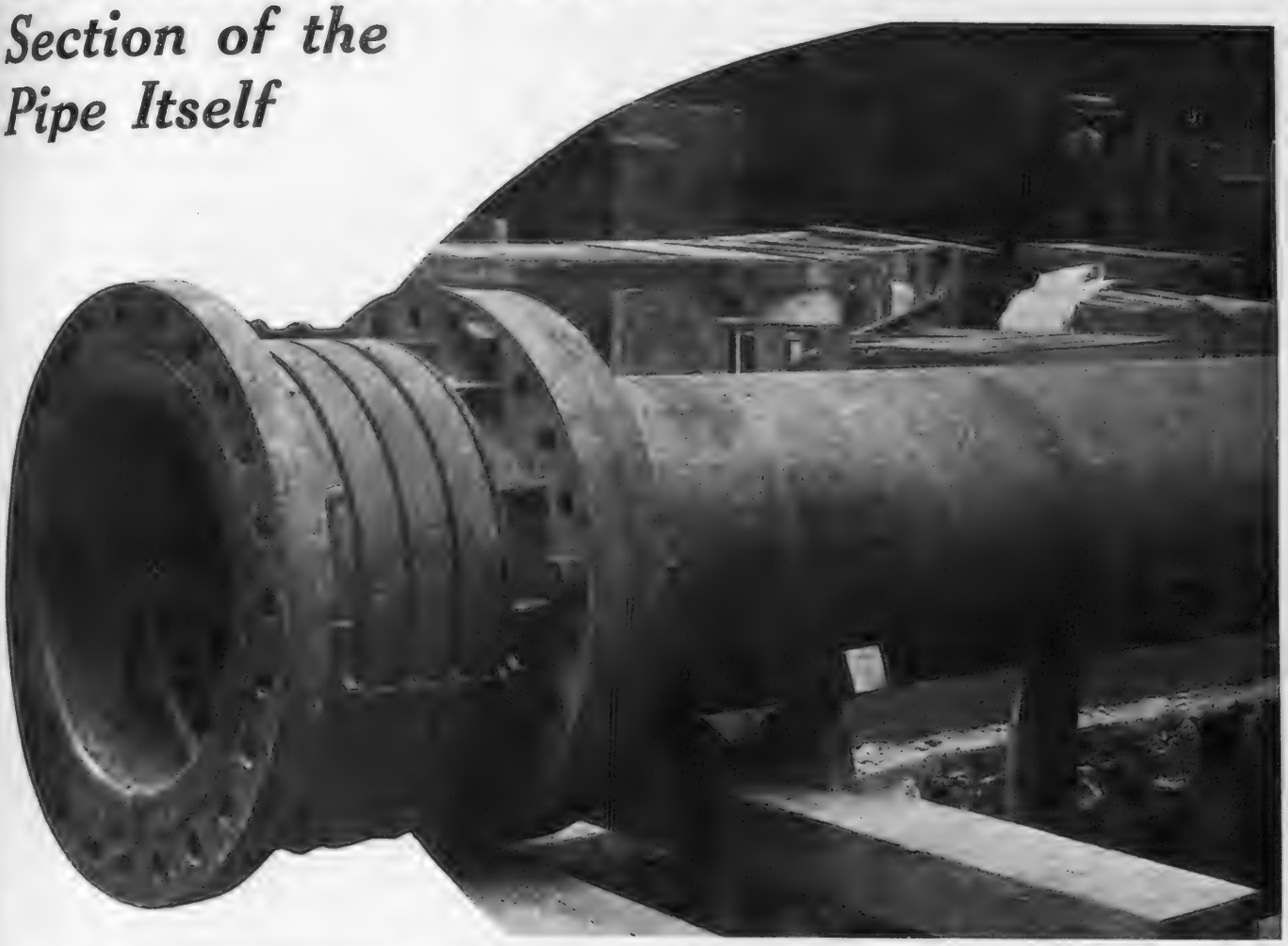


Pipe Hanger Shell **Rod Hanger Shell** **Strap Hanger Shell**

PHILLIPS SELF-DRILLING EXPANSION SHELLS are recommended for fastening pipe and other hangers and apparatus to concrete ceilings, walls and floors. **EVERY SHELL IS A DRILL**, and a new sharp drill for every hole means absolute economy in time and labor installing. Right in principle it makes a neat fitting hole, then enlarges the hole at bottom and is expanded hard and tight in the enlarged hole.

PHILLIPS DRILL COMPANY
1537 Cortland Street
CHICAGO, ILLINOIS

A Corrugated Copper Expansion Joint that can be Installed like a small Section of the Pipe Itself



Service

To complete the cycle of Badger efficiency we offer, without obligation, the services of our Engineering Department in selecting the right joint for each Badger installation. This service is based on eighty-three years' experience in the manufacture of metal specialties.

BESIDES embodying all the requirements demanded of an expansion joint, the Badger Self-Equalizing Expansion Joint boasts of many distinct advantages.

Among these features are its compactness and ease of installation. The above illustration shows a Badger Self-Equalizing Expansion Joint ready for installation in one of the biggest high pressure steam jobs in New York City. Note that this expansion joint requires no more space than the pipe itself and that the installation necessitates merely the bolting in place like a small section of the pipe itself.

Before recommending your next expansion joints, let our engineers explain Badger advantages—one piece, no packing or adjusting, equal expansion, elimination of leaks, ease of installation, proper depth of corrugations, and many other.

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BADGER QUALITY

ENGINEERS' SPECIFICATION INDEX

AIR COMPRESSORS.

Nash Engineering Co., So. Norwalk, Conn.
Powers Regulator Co., Chicago, Ill.

AIR CONDITIONING APPARATUS.

American Blower Co., Detroit, Mich.
Atmospheric Conditioning Corporation, Philadelphia, Pa.
Bayley Mfg. Co., Milwaukee, Wis.
Buckeye Blower Co., Columbus, O.
Carrier Air Conditioning Co., of America, Buffalo, N. Y.
Carrier Engineering Corporation, Newark, N.J.
Clarage Fan Co., Kalamazoo, Mich.
Fleisher Co., Inc., W. L. New York.
Grinnell Company, Providence, R. I.
Ilg Electric Ventilating Co., Chicago, Ill.
Massachusetts Blower Co., Watertown, Mass.
Midwest Air Filters, Inc., New York.
New York Blower Co., Chicago, Ill.
Reed Air Filter Co., Inc., Louisville, Ky.
Spray Engineering Co., Boston, Mass.
Sturtevant Co., B. F., Hyde Park, Mass.
L. J. Wing Mfg. Co., New York.

AIR COOLING AND DRYING SYSTEMS.

Aerofin Corp., Newark, N. J.
Atmospheric Conditioning Corp., Phila., Pa.
Bayley Mfg. Co., Milwaukee, Wis.
Buckeye Blower Co., Columbus, O.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corporation, Newark, N.J.
Clarage Fan Co., Kalamazoo, Mich.
Cooling Tower Co., New York.
Fleisher Co., Inc., W. L., New York
Ilg Electric Ventilating Co., Chicago, Ill.
Massachusetts Blower Co., Watertown, Mass.
Midwest Air Filters, Inc., New York.
New York Blower Co., Chicago, Ill.
Seymour, James M., Newark, N. J.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Spray Engineering Co., Boston, Mass.
Stickle Steam Specialties Co., Indianapolis, Ind.
Sturtevant Co., B. F., Hyde Park, Mass.
L. J. Wing Mfg. Co., New York.
York Heating & Ventilating Co., Philadelphia, Pa.

AIR ELIMINATORS.

Jas. P. Marsh & Co., Chicago, Ill.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Midwest Air Filters, Inc., New York.

AIR FILTERS.

Midwest Air Filters, Inc., New York.
Reed Air Filter Co., Inc., Louisville, Ky.
Spray Engineering Co., Boston, Mass.

AIR SEPARATORS.

Griscom-Russell Co., New York.
Hoffman Specialty Co., New York.

AIR WASHERS.

American Blower Co., Detroit, Mich.
Atmospheric Conditioning Corp., Phila., Pa.
Badger & Sons Co., E. B., Boston, Mass.
Bayley Mfg. Co., Milwaukee, Wis.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corp., Newark, N. J.
Clarage Fan Co., Kalamazoo, Mich.
Cooling Tower Co., Inc., New York.
Fleisher Co., Inc., W. L. New York.
Ilg Electric Ventilating Co., Chicago, Ill.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Reed Air Filter Co., Inc., Louisville, Ky.
Spray Engineering Co., Boston, Mass.
Sturtevant Co., B. F., Hyde Park, Mass.

BLOWERS

Fan.

American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Bayley Mfg. Co., Milwaukee, Wis.
Buckeye Blower Co., Columbus, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
Ilg Electric Ventilating Co., Chicago, Ill.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Mass.
L. J. Wing Mfg. Co., New York.
York Heating & Ventilating Co., Philadelphia, Pa.

Pressure.

American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Mass.
L. J. Wing Mfg. Co., New York.

Rotary.

Sturtevant Co., B. F., Hyde Park, Mass.
L. J. Wing Mfg. Co., New York.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

Turbine.

Sturtevant Co., B. F., Hyde Park, Mass.
L. J. Wing Mfg. Co., New York.

BOILER CEMENT.

Johns-Manville, Inc., New York.

BOILERS.

Down-Draft.

American Radiator Co., Chicago, Ill.
Brownell Co., The, Dayton, O.
General Boilers Co., Waukegan, Ill.
Hart and Crouse, Utica, N. Y.
Illinois Malleable Iron Co., Chicago, Ill.
Kewanee Boiler Co., Kewanee, Ill.
Oil City Boiler Works, Oil City, Pa.
Page Boiler Co., Wm. H., New York.
Pierce, Butler & Pierce Mfg. Co., New York.
Stanwood Corporation, Cincinnati, Ohio.
Universal Smokeless Boiler Co., Ravenna, O.

Heating.

American Radiator Co., Chicago, Ill.
Brownell Co., The, Dayton, O.
Bryant Heater & Mfg. Co., Cleveland, Ohio.
Burnham Boiler Corp., Irvington, N. Y.
Continental Heater Corp., Dunkirk, N. Y.
Cox Stove Co., Abram, Philadelphia, Pa.
Frost Mfg. Co., Chicago, Ill.
General Boilers Co., Waukegan, Ill.
Gorton & Lidgerwood Co., New York.
Grinnell Company, Providence, R. I.
Gurney Heater Mfg. Co., Boston, Mass.
Handon Boiler Corp., New York.
Heggie Simplex Boiler Co., Boston, Mass.
Illinois Malleable Iron Co., Chicago, Ill.
International Heater Co., Utica, N. Y.
Kewanee Boiler Co., Kewanee, Ill.
Niagara Radiator & Boiler Co., North Tonawanda, N. Y.
Oil City Boiler Works, Oil City, Pa.
Page Boiler Co., Wm. H., New York
Pierce, Butler & Pierce Mfg. Co., New York.
Stanwood Corporation, Cincinnati, Ohio.
Thatcher Co., Newark, N. J.
Titusville Iron Works, Titusville, Pa.
Universal Smokeless Boiler Co., Ravenna, O.
Utica Heater Co., Utica, N. Y.
Weil-McLain Co., Chicago, Ill.

Power.

Frost Mfg. Co., Chicago, Ill.
Heggie Simplex Boiler Co., Joliet, Ill.
Kewanee Boiler Co., Kewanee, Ill.
Oil City Boiler Works, Oil City, Pa.
Stanwood Corporation, Cincinnati, Ohio.
Titusville Iron Works Co., Titusville, Pa.

CALORIMETERS.

American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Sarco Co., New York.

COILS, PIPE.

American Blower Co., Detroit, Mich.
Bayley Mfg. Co., Milwaukee, Wis.
Buckeye Blower Co., Columbus, O.
Buffalo Forge Co., Buffalo, N. Y.
Griscom-Russell Co., New York.
National Pipe Bending Co., New Haven, Conn.
Whitlock Coil Pipe Co., Hartford, Conn.

Air.

New York Blower Co., Chicago, Ill.

CONDENSERS.

Alberger Heater Co., Buffalo, N. Y.
American Radiator Co., Chicago, Ill.
American Steam Pump Co., Battle Creek, Mich.
Buffalo Forge Co., Buffalo, N. Y.
Elliott Co., Jeanette, Pa.
Griscom-Russell Co., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
Wheeler Condenser & Engineering Co., Carteret, N. J.
Whitlock Coil Pipe Co., Hartford, Conn.

CONVERTERS, HOT WATER.

Alberger Heater Co., Buffalo, N. Y.
Griscom-Russell Co., New York.
National Pipe Bending Co., New Haven, Conn.
Patterson-Kelley Co., New York.
Ross Heater & Mfg. Co. Inc., Buffalo, N. Y.
Whitlock Coil Pipe Co., Hartford, Conn.
Wyckoff & Son Co., A., Elmira, N. Y.

COOLERS.

Oil.

Alberger Heater Co., Buffalo, N. Y.
Griscom-Russell Co., New York.
National Pipe Bending Co., New Haven, Conn.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Whitlock Coil Pipe Co., Hartford, Conn.

COOLING TOWERS.

Badger & Sons Co., E. B., Boston, Mass.
Cooling Tower Co., New York.
Spray Engineering Co., Boston, Mass.

COPPER BOILERS.

Dahlquist Mfg. Co., Boston, Mass.

COPPER KETTLES.

Dahlquist Mfg. Co., Boston, Mass.

COVERING PIPE.

American District Steam Co., No. Tonawanda, N. Y.
Hornung, J. C., Chicago, Ill.
Johns-Manville Inc., New York.
Ric-Wil Co., Cleveland, O.
Wyckoff & Son Co., A, Elmira, N. Y.

DAMPERS, DUCT.

American Blower Co., Detroit, Mich.
Buckeye Blower Co., Columbus, O.
York Heating & Ventilating Co., Philadelphia, Pa.

DEHUMIDIFYING APPARATUS.

American Blower Co., Detroit, Mich.
Atmospheric Conditioning Corp., Phila., Pa.
Bayley Mfg. Co., Milwaukee, Wis.
Carrier Engineering Corp., Newark, N. J.
Cooling Tower Co., New York.
Fleisher Co., Inc., W. L., New York.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Mass.

DISTILLERS, (Water).

Badger & Sons Co., E. B., Boston, Mass.
Griscom-Russell Co., New York.
Ross Heater & Mfg. Co. Inc., Buffalo, N. Y.

DRAFT APPLIANCES.

Crown Fuel Saver Co., Richmond, Ind.
Wolff Coal Saver Co., Chicago, Ill.

DRYING SYSTEMS.

(See Air Cooling and Drying Systems.)

DUST COLLECTING SYSTEMS.

American Blower Co., Detroit, Mich.
Bayley Mfg. Co., Milwaukee, Wis.
Buckeye Blower Co., Columbus, O.
Buffalo Forge Co., Buffalo, New York.
Clarage Fan Co., Kalamazoo, Mich.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Mass.
York Heating & Ventilating Co., Philadelphia, Pa.

DUST COLLECTORS.

American Blower Co., Detroit, Mich.
Atmospheric Conditioning Corp., Phila., Pa.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Co., Newark, N. J.
Clarage Fan Co., Kalamazoo, Mich.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F. Hyde Park, Mass.
York Heating & Ventilating Co., Philadelphia, Pa.

DUST DETERMINATORS.

Atmospheric Conditioning Corp., Phila., Pa.

ENGINES.

Steam, Automatic.

American Blower Co., Detroit, Mich.
Brownell Co., The, Dayton, O.
Clarage Fan Co., Kalamazoo, Mich.
New York Blower Co., Chicago, Ill.
Stanwood Corporation, Cincinnati, Ohio.
Sturtevant Co., B. F., Hyde Park, Mass.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

Steam, High Speed.

American Blower Co., Detroit, Mich.
Brownell Co., The, Dayton, O.
Clarage Fan Co., Kalamazoo, Mich.
New York Blower Co., Chicago, Ill.
Pierce, Butler & Pierce Mfg. Co., New York.
Sturtevant Co., B. F., Hyde Park, Mass.

EQUALIZING LOOPS.

Hoffman Specialty Co., New York.

EVAPORATORS.

Boiler Feed Make-Up.

Badger & Sons Co., E. B., Boston, Mass.
Griscom-Russell Co., New York.
Ross Heater & Mfg. Co., Inc., Buffalo, N. Y.
Whitlock Coil Pipe Co., Hartford, Conn.

EXHAUST HEADS.

Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
Patterson-Kelley Co., New York.
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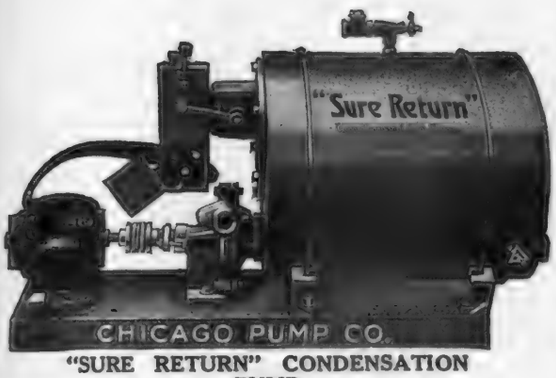

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Buffalo Forge Co., Buffalo, N. Y.
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Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Mass.
Wing Mfg. Co., L. J., New York.
York Heating & Ventilating Co., Philadelphia, Pa.

EXPANSION JOINTS.
American District Steam Co., No. Tonawanda, N. Y.
Badger & Sons Co., E. B., Boston, Mass.
Central Station Steam Co., Detroit, Mich.
Dahlquist Mfg. Co., Boston, Mass.
Griscom-Russell Co., New York.
Hornung, J. C., Chicago, Ill.
Howard Iron Works, Buffalo, N. Y.
Illinois Engineering Co., Chicago, Ill.
Ric-Wil Co., Cleveland, O.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Webster & Co., Warren, Camden, N. J.
Wheeler Condenser & Engineering Co., Carteret, N. J.

EXPANSION SHELLS
Phillips Drill Co., Chicago, Ill.

FANS, EXHAUST.
Amercan Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Bayley Mfg. Co., Milwaukee, Wis.
Buckeye Blower Co., Columbus, O.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
Ilg Electric Ventilating Co., Chicago, Ill.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Seymour, James M., Newark, N. J.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Mass.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
L. J. Wing Mfg. Co., New York.
York Heating & Ventilating Co., Philadelphia, Pa.

FEEDERS
Boiler
Kieley & Mueller, Inc., New York.
McDonnell & Miller, Chicago, Ill.

FILTERS, (Aerating).
Griscom-Russell Co., New York.

Feed-Water.
Elliot Co., Jeanette, Pa.
Griscom-Russell Co., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.

FITTINGS, FLANGED.
American District Steam Co., No. Tonawanda, N. Y.
Clow and Sons, Jas. B., Chicago, Ill.
Grinnell Company, Providence, R. I.

FLANGES.
American District Steam Co., No. Tonawanda, N. Y.
Jenkins Bros., New York.

GAS BURNERS
Cleveland Gas Burner & Appliance Co., Detroit, Mich.
Franklin Gas Burner Mfg. Co., Cincinnati, O.

GASKETS, METALLIC.
Sarco Co., New York.

GAUGE BOARDS.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bishop & Babcock Co., Cleveland, Ohio.
Bristol Co., Waterbury, Conn.
Foxboro Co., Inc., The, Foxboro, Mass.
McAlear Mfg. Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Webster & Co., Warren, Camden, N. J.

GAUGES.
Altitude.
Pierce, Butler & Pierce Corp., New York.

Draft.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Foxboro Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.

Hydraulic.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Foxboro Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.

Ounce Graduated.
Marsh & Co., Jas. P., Chicago, Ill.
O-E Specialty Co., Milwaukee, Wis.

Pressure.
American Dist. Steam Co., North Tonawanda, N. Y.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bristol Co., Waterbury, Conn.
Foxboro Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Webster & Co., Warren, Camden, N. J.
Bishop & Babcock Co., Cleveland, Ohio.

Vacuum.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bristol Co., Waterbury, Conn.
Foxboro Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Webster & Co., Warren, Camden, N. J.

Vacuum (Compound).
Cashin Co., W. D., Boston, Mass.
Pierce, Butler & Pierce Corp., New York.

Water.
American District Steam Co., No. Tonawanda, N. Y.
American Schaeffer & Budenburg Corp., Brooklyn, N. Y.
Bristol Co., Waterbury, Conn.
Bristol Co., Waterbury, Conn.
Jenkins Bros., New York.

GENERATOR COOLING SYSTEMS.
Atmospheric Conditioning Corp., Phila., Pa.
Bayley Mfg. Co., Milwaukee, Wis.
Carrier Air Conditioning Co., of America, Buffalo, N. Y.
Cooling Tower Co., New York.
Sturtevant Co., B. F., Hyde Park, Mass.

GOVERNORS, (Pump).
Atlas Valve Co., Newark, N. J.
Davis Regulator Co., G. M., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
Mason Regulator Co., Boston, Mass.
Stickle Steam Specialties Co., Indianapolis, Ind.
Westinghouse Elec. &. Mfg. Co., East Pittsburgh, Pa.
Wright-Austin Co., Detroit, Mich.

GRATES
Dumping
Pyramid Iron Products Co., New York.

Rocking
Pyramid Iron Products Co., New York.

Shaking
Pyramid Iron Products Co., New York.

Shaking and Dumping
Pyramid Iron Products Co., New York.

Shaking, Circular
Pyramid Iron Products Co., New York.

Stationary
Pyramid Iron Products Co., New York.

HEATERS.
Domestic Water.
Alberger Heater Co., Buffalo, N. Y.
American District Steam Co., No. Tonawanda, N. Y.
American Radiator Co., Chicago, Ill.
Bryant Heater & Mfg. Co., Cleveland, Ohio.
Burnham Boiler Corp., Irvington, N. Y.
Dahlquist Mfg. Co., Boston, Mass.
Everhot Heater Co., Detroit, Mich.
Excelso Specialty Works, Buffalo, N. Y.
National Pipe Bending Co., New Haven, Conn.
Page Boiler Co., Wm. H., New York.
Patterson-Kelley Co., New York.
Pierce, Butler & Pierce Corp., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Sims Co., Erie, Pa.
Whitlock Coil Pipe Co., Hartford, Conn.

Electrical Unit
Ilg Electric Ventilating Co., Chicago, Ill.

Feed Water, (Closed).
Alberger Heater Co., Buffalo, N. Y.
Griscom-Russell Co., New York.
McAlear Mfg. Co., Chicago, Ill.
National Pipe Bending Co., New Haven, Conn.
Patterson-Kelley Co., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Sims Co., Erie, Pa.
Wheeler Condenser & Engineering Co., Carteret, N. J.
Whitlock Coil Pipe Co., Hartford, Conn.

Feed Water, (Open).
Griscom-Russell Co., New York.
Sims Co., Erie, Pa.
Stickle Steam Specialties Co., Indianapolis, Ind.
Webster & Co., Warren, Camden, N. J.

Fuel-oil.
Alberger Heater Co., Buffalo, N. Y.
American Blower Co., Detroit, Mich.
Griscom-Russell Co., New York.
National Pipe Bending Co., New Haven, Conn.
Ross Heater & Mfg. Inc., Buffalo, N. Y.
Whitlock Coil Pipe Co., Hartford, Conn.

Air, Fan System.
Aerofin Corporation, Newark, N. J.
American Blower Co., Detroit, Mich.
American Radiator Co., Chicago, Ill.
Bayley Mfg. Co., Milwaukee, Wis.
Buckeye Blower Co., Columbus, O.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Mass.

Portable Unit Air.
American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Buffalo Forge Co., Buffalo, N. Y.
Dwyer Equipment Co., Chicago, Ill.
Ilg Electric Ventilating Co., Chicago, Ill.
Pecco Incorporated, St. Louis, Mo.
Skinner Bros. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Mass.
Supreme Heater & Ventilating Corp., St. Louis, Mo.
L. J. Wing Mfg. Co., New York.
York Heating & Ventilating Co., Philadelphia, Pa.
(See also Ventilators, Portable Unit.)

HEATING SYSTEMS.
"Gasteam".
James B. Clow & Sons, Chicago, Ill.

Vacuum.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Co., Cleveland, Ohio.
Cashin Co., W. D., Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Klipfel Mfg. Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
O-E Specialty Co., Milwaukee, Wis.
Sarco Co., New York.
Sterling Engineering Co., Milwaukee, Wis.
Stickle Steam Specialties Co., Indianapolis, Ind.
Webster & Co., Warren, Camden, N. J.

Vapor.
American District Steam Co., No. Tonawanda, N. Y.
Barnes & Jones, Boston, Mass.
Cashin Co., W. D., Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Gorton & Lidgerwood Co., New York.
Grinnell Company, Providence, R. I.
Haines & Co., Wm. S., Philadelphia, Pa.
Ideal Heating Equip. Co., Cleveland, Ohio.
Illinois Engineering Co., Chicago, Ill.
Illinois Malleable Iron Co., Chicago, Ill.
Klipfel Mfg. Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Mouat Vapor Heating Co., Cleveland, O.
H. W. Nelson Co., Moline, Ill.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Sarco Co., New York.
Simplex Heating Specialty Co., Inc., Lynchburg, Va.
Sterling Engineering Co., Milwaukee, Wis.
Trane & Co., La Crosse, Wis.
Webster & Co., Warren, Camden, N. J.

Water.
Grinnell Company, Providence, R. I.
Thrush & Co., H. A., Peru, Ind.

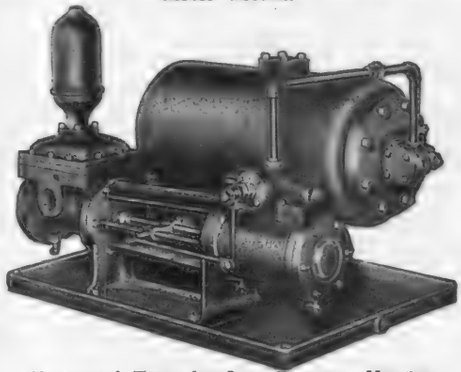
HUMIDIFIERS
American Blower Co., Detroit, Mich.
Atmospheric Conditioning Corp., Phila., Pa.
Bayley Mfg. Co., Milwaukee, Wis.
Carrier Air Conditioning Co., of America, Buffalo, N. Y.
Carrier Engineering Corporation, Newark, N. J.
Grinnell Company, Providence, R. I.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Seymour, James M., Newark, N. J.
Sturtevant Co., B. F., Hyde Park, Mass.

HUMIDITY CONTROL.
American Blower Co., Detroit, Mich.
Atlas Valve Co., Newark, N. J.
Atmospheric Conditioning Corp., Phila, Pa.
Bayley Mfg. Co., Milwaukee, Wis.
Carrier Air Conditioning Co., of America, Buffalo, N. Y.
Carrier Engineering Corp., Newark, N. J.
Foxboro Co., Inc., The Foxboro, Mass.
Grinnell Company, Providence, R. I.
Klipfel Mfg. Co., Chicago, Ill.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Powers Regulator Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Mass.

INSTRUMENTS
Electric Measuring.
Bristol Co., Waterbury, Conn.
Westinghouse Electric & Mfg. Co., East Pittsburg, Pa.

Indicating and Recording.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bristol Co., Waterbury, Conn.
Bailey Meter Co., Cleveland, O.
Foxboro Co., Inc., The Foxboro, Mass.

Horizontal Type for Low Pressure Heating Systems, Motor Driven.



Horizontal Type for Low Pressure Heating Systems. Steam Driven.

AMERICAN-MARSH

Condensation Pumps for Heating System

The demand for dependable and efficient pumping equipment for heating systems is being met by the American-Marsh Condensation Pump. These pumps are developed in both steam and motor driven, in either vertical or horizontal types. American-Marsh Condensation pumps are delivering the highest type of service in every pumping capacity. Let our engineers solve your pumping problems. Get the installation that meets your exact requirements.

The Line Includes

- Boiler Feed Pumps,
- Vacuum Pumps, steam and motor driven.
- Hot Water Circulating Pumps
- Sump or Bilge Pumps
- Condensation Pumps, steam and motor driven, vertical and horizontal
- Automatic Boiler Feed Pumps and Receivers

Write for Bulletins

AMERICAN STEAM PUMP COMPANY
BATTLE CREEK, MICHIGAN

You'll Need Them For Your Heating Systems

Taylor Boiler Feed Trap

A Trap that works with perfection and eliminates all boiler feed troubles.

Reliable service such as we guarantee protects your boilers against cracked sections, burnouts, etc., by maintaining the proper water line.

Taylor Motor-Driven Automatic, Centrifugal Pumps and Receivers

For low pressure heating systems. Will drain all condensation from heating coils and return condensation back to boiler. Made of gray iron and bronze. Fitted for hot water.

A Quick, Sure and Economical Way to Feed the Boiler. ***Let us send details in full.***

TAYLOR MACHINE WORKS

85 S. Monroe St., Battle Creek, Mich., U. S. A.

ENGINEERS' SPECIFICATION INDEX (Continued)

Marsh & Co., Jas. P., Chicago, Ill.
Sarco Co., New York
Westinghouse Elec. & Mfg. Co., East Pittsburg, Pa

INSULATING MATERIALS.

American District Steam Co., No. Tonawanda, N. Y.
Armstrong Cork & Insulation Co., Pittsburgh, Pa.
Hornung, J. C., Chicago, Ill.
Johns-Manville, Inc., New York.
Ric-Wil Co., Cleveland, O.
Union Fibre Co., Winona, Minn.
Wyckoff & Sons, A., Elmira, N. Y.

MANOMETERS.

American Schaeffer & Budenberg Corp., Brooklyn, N. Y.

MECHANICAL DRAFT APPARATUS.

American Blower Co., Detroit, Mich.
Buckeye Blower Co., Columbus, O.
Clarage Fan Co., Kalamazoo, Mich.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park Mass.
L. J. Wing Co., New York.

METERS.

Condensation.

American Dist. Steam Co., No. Tonawanda, N. Y.
Central Station Steam Co., Detroit, Mich.
Hornung, J. C., Chicago, Ill.

Feed Water.

Central Station Steam Co., Detroit, Mich.

Feed Water (Wier Type).

Webster & Co., Warren, Camden, N. J.

Flow

American District Steam Co., North Tonawanda, N. Y.
Spray Engineering Co., Boston, Mass.

Pitot Tube.

American Blower Co., Detroit, Mich.

Steam.

American District Steam Co., No. Tonawanda, N. Y.
Foxboro Co., Inc., The Foxboro, Mass.

MOTORS (Electric).

Sturtevant Co., B. F., Hyde Park, Mass.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

NOZZLES, SPRAY

American Blower Co., Detroit, Mich.
Atmospheric Conditioning Co., Phila., Pa.
Badger & Sons Co., E. B., Boston, Mass.
Bayley Manufacturing Co., Milwaukee, Wis.
Carrier Air Conditioning Co. of America, Buffalo, N. Y.
Carrier Engineering Co., Newark, N. J.
Clarage Fan Co., Kalamazoo, Mich.
New York Blower Co., Chicago, Ill.
Spray Engineering Co., Boston, Mass.
Sturtevant Co., B. F., Hyde Park, Mass.

OIL BURNING EQUIPMENT

Heat Equipment Corp., Lincoln, Neb.
Johnson Co., S. T., Oakland, Cal.

OZONE APPARATUS.

United States Ozone Co., Scottdale, Pa.

PIPE.

Cast Iron.

Clow & Sons, Jas. B., Chicago, Ill.

Steel.

National Tube Co., Pittsburgh, Pa.

Wood.

Wyckoff & Sons Co., A., Elmira, N. Y.

PIPE BENDING.

Badger & Sons Co., E. B., Boston, Mass.
Buffalo Forge Co., Buffalo, N. Y.
Grinnell Company, Providence, R. I.
National Pipe Bending Co., New Haven, Conn.
Whitlock Coil Pipe Co., Hartford, Conn.

PIPE CASING (Wood).

American District Steam Co., No. Tonawanda, N. Y.
Wyckoff & Sons Co., A., Elmira, N. Y.

PIPE HANGERS.

Grinnell Company, Providence, R. I.
Jenkins Bros., New York.

PIPE, POWER.

Grinnell Company, Providence, R. I.

PUMPS.

Centrifugal.

American Steam Pump Co., Battle Creek, Mich.
Buffalo Steam Pump Co., Buffalo, N. Y.
Chicago Pump Co., Chicago, Ill.
Economy Pumping Machinery Co., Chicago, Ill.
Nash Engineering Co., So. Norwalk, Conn.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
Wheeler Condenser & Engineering Co., Carteret, N. J.
Yeomans Bros. Co., Chicago, Ill.
Young Pump Co., Michigan City, Ind.

Condensation.

American Steam Pump Co., Battle Creek, Mich.
Buffalo Steam Pump Co., Buffalo, N. Y.
Chicago Pump Co., Chicago, Ill.
Economy Pumping Machinery Co., Chicago, Ill.
Wright-Austin Co., Detroit, Mich.
Yeomans Bros. Co., Chicago, Ill.
Wright-Austin Co., Detroit, Mich.
Yeomans Bros. Co., Chicago, Ill.

Rotary.

Nash Engineering Co., So. Norwalk, Conn.

Steam.

American Steam Pump Co., Battle Creek, Mich.
Buffalo Steam Pump Co., Buffalo, N. Y.
Nash Engineering Co., So. Norwalk, Conn.

Turbine.

Nash Engineering Co., So. Norwalk, Conn.
Wheeler Condenser & Engineering Co., Carteret, N. J.
Yoemans Bros., Chicago, Ill.

Vacuum.

American Steam Pump Co., Battle Creek, Mich.
Bishop & Babcock Co., Cleveland, Ohio.
Chicago Pump Co., Chicago, Ill.
Economy Pumping Machinery Co., Chicago, Ill.
Elliott Co., Jeannette, Pa.
McAlear Mfg. Co., Chicago, Ill.
Nash Engineering Co., So. Norwalk, Conn.
Ross Heater & Mfg. Co., Inc., Buffalo, N. Y.
Skidmore Corp., Chicago, Ill.
Trane Co., La Crosse, Wis.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Yeomans Bros., Chicago, Ill.
Young Pump Co., Michigan City, Ind.

RADIATOR BUSHINGS.

Metering.

Holley Mfg. Co., Virginia, Minn.

RADIATOR HANGERS.

Gloeckle, Jr., A. F., Rochester, N. Y.
Grinnell Company, Providence, R. I.
Healy-Ruff Co., Minneapolis, Minn.
Pierce, Butler & Pierce Mfg. Co., New York.

RADIATORS.

"Gasteam."

James B. Clow & Sons, Chicago, Ill.

"Gaswater."

Clow & Sons, Jas. B., Chicago, Ill.

RADIATORS, STEAM AND WATER.

Aerofin Corp., Newark, N. J.
American Radiator Co., Chicago, Ill.
International Heater Co., Utica, N. Y.
Gurney Heater Mfg. Co., Boston, Mass.
Lyon Products Co., Chicago, Ill.
Pierce, Butler & Pierce Mfg. Co., New York.

RECEIVERS.

Air.

American District Steam Co., No. Tonawanda, N. Y.
The Brownell Co., Dayton, Ohio.
Kieley & Mueller, Inc., New York.
Sterling Engineering Co., Milwaukee, Wis.

Condensation.

Chicago Pump Co., Chicago, Ill.
Davis Regulator Co., G. M., Chicago, Ill.
Economy Pumping Machinery Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Yeomans Bros., Chicago, Ill.

REGULATORS.

Boiler-Feed.

Kieley & Mueller, Inc., New York.
Klipfel Mfg. Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
National Regulator Co., Chicago, Ill.
Stickle Steam Specialties Co., Indianapolis, Ind.
Thrush & Co., H. A., Peru, Ind.
Wright-Austin Co., Detroit, Mich.

Damper.

American Dist. Steam Co., No. Tonawanda, N. Y.
Atlas Valve Co., Newark, N. J.
American Radiator Co., Chicago, Ill.
Bishop & Babcock Co., Cleveland, Ohio.
Davis Regulator Co., G. M., Chicago, Ill.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
Mueller Co., Decatur, Ill.
National Regulator Co., Chicago, Ill.
Nelson Co., H. W., Moline, Ill.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Powers Regulator Co., Chicago, Ill.
Simplex Heating Specialty Co., Inc., Lynchburgh, Va.
Sterling Engineering Co., Milwaukee, Wis.
Stickle Steam Specialties Co., Indianapolis, Ind.
Thrush & Co., H. A., Peru, Ind.
Trane Co., La Crosse, Wis.
L. J. Wing Mfg. Co., New York.

Pressure.

American District Steam Co., No. Tonawanda, N. Y.
Atlas Valve Co., Newark, N. J.
Davis Regulator Co., G. M., Chicago, Ill.
Foxboro Co., Inc., The Foxboro, Mass.
Hornung, J. C., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
Klipfel Mfg. Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Minneapolis Heat Regulator Co., Minneapolis, Minn.
National Regulator Co., Chicago, Ill.
Powers Regulator Co., Chicago, Ill.
Stickle Steam Specialties Co., Indiapapolis, Ind.
Thrush & Co., H. A., Peru, Ind.

Temperature.

American Radiator Co., Chicago, Ill.
Atlas Valve Co., Newark, N. J.
Bishop & Babcock Co., Cleveland, Ohio.
Carrier Engineering Corporation, Newark, N. J.
Elliott Co., Jeannette, Pa.
Foxboro Co., Inc., The Foxboro, Mass.
Fulton Co., Knoxville, Tenn.
Gold Car Heating & Lighting Co., Brooklyn,
Hornung, J. C., Chicago, Ill.
Johnson Service Co., Milwaukee, Wis.
Kieley & Mueller, Inc., New York.
Klipfel Mfg. Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Minneapolis Heat Regulator Co., Minneapolis, Minn.
National Regulator Co., Chicago, Ill.
Powers Regulator Co., Chicago, Ill.
Sarco Co., New York.

SEPARATORS.

Oil.

Elliott Co., Jeannette, Pa.
Griscom-Russell Co., New York.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
Stickle Steam Specialties Co., Indianapolis, Ind.
Wright-Austin Co., Detroit, Mich.

Steam.

American District Steam Co., No. Tonawanda, N. Y.
Bishop & Babcock Co., Cleveland, Ohio.
Elliott Co., Jeannette, Pa.
Griscom-Russell Co., New York.
Illinois Engineering Co., Chicago, Ill
McAlear Mfg. Co., Chicago, Ill.
Patterson-Kelley Co., New York.
Sims Co., Erie, Pa.
Stickle Steam Specialties Co., Indianapolis, Ind.
Webster & Co., Warren, Camden, N. J.
Wright-Austin Co., Detroit, Mich.

SPRAY COOLING SYSTEMS.

Atmospheric Conditioning Corp., Phila., Pa.
Bayley Mfg. Co., Milwaukee, Wis.
Cooling Tower Co., New York.
Massachusetts Blower Co., Watertown, Mass
Seymour, James M., Newark, N. J.

SPRAY NOZZLES

(See Nozzles, Spray)

SPRINKLER HEADS

C. S. B. Sprinkler Co., Boston, Mass.

STRAINERS.

Oil.

Elliott Co., Jeannette, Pa.
Griscom-Russell Co., New York.
Kieley & Mueller, Inc., New York.
Ross Heater & Mfg. Co., Inc., Buffalo, N. Y.

Pipe

Spray Engineering Co., Boston, Mass.

Steam.

American Dist. Steam Co., No. Tonawanda, N. Y.
Dunham Co., C. A., Chicago, Ill.
Eliott Co., Jeannette, Pa.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
Mason Regular Co., Boston, Mass.
McAlear Mfg. Co., Chicago, Ill.
Sarco Co., New York.
Sterling Engineering Co, Milwaukee, Wis.
Wright-Austin Co., Detroit, Mich.

Water.

American Dist. Steam Co., No. Tonawanda, N. Y.
Davis Regulator Co., G. M., Chicago, Ill.
Griscom-Russell Co., New York.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
Mason Regulator Co., Boston, Mass.
Ross Heater & Mfg. Co., Inc., Buffalo, N. Y.
Sarco Co., New York.
Spray Engineering Co., Boston, Mass.

THERMOMETERS.

(Recording and Indicating).

American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bristol Co., Waterbury, Conn.
Foxboro Co., Inc., The Foxboro, Mass.
Powers Regulator Co., Chicago, Ill.
Sarco Co., New York.

Water.

Marsh & Co., Jas. P., Chicago, Ill.
Pierce, Butler & Pierce Corp., New York.

THERMOSTATS.

American Radiator Co., Chicago, Ill.
Atlas Valve Co., Newark, N. J.
Bishop & Babcock Co., Cleveland, Ohio.
Fulton Co., Knoxville, Tenn.
Gold Car Heating & Lighting Co., Brooklyn,
Johnson Service Co., Milwaukee, Wis.
Klipfel Mfg. Co., Chicago, Ill.
Minneapolis Heat Regulator Co., Minneapolis. Minn.
Powers Regulator Co.. Chicago, Ill.

YOUNG

Vacuum and Boiler Feed

PUMPS

Size V2 for 16,000 square feet of radiation, equipped for continuous operation, requiring only 1½ H.P. Motor when pulling 10 inches vacuum and discharging against 20 pounds pressure at pump.

Illustration shows unit as shipped from factory.

CENTRIFUGAL VACUUM PRESSURE PUMPS

Simplicity—
Reliability—
Efficiency

Simplicity in principle, quality in construction, reliability and efficiency in operation are the essentials you seek in an electric vacuum pump.

These are combined in the new design of Young Vacuum Pumps, produced by an organization whose purpose and record is to attain the best.

The selection of manual or automatic control for the individual requirements of the vacuum system are clearly explained in our latest Bulletin No. 5. This will be mailed upon request.

YOUNG PUMP COMPANY

230 EAST OHIO STREET, CHICAGO

Represented in all principal cities

FACTORY: MICHIGAN CITY, INDIANA

SKIDMORE

The New Type "B"

THE Skidmore Hydro Turbine Vacuum and Boiler Feed Pump is now entering its fifth year.

Units that have been in service four heating seasons show the same efficiency that was shown when installed.

The new type offered retains all the advantages of those now in service, the change in design being in the casing to secure a more compact and sturdy unit.

All parts are of high grade cast iron or bronze, accurately machined.

There are no close clearances on moving parts and no piping is required to set the unit.

A self-contained unit all on one base.

Built in seven sizes for 10 to 60 lbs. pressure to handle 5,000, 8,000, 16,000, 26,000, 40,000, 65,000 and 100,000 sq. ft. of radiation for continuous service or with automatic control

SKIDMORE CORPORATION

General Offices and Factory

1535 Dayton St. CHICAGO, U. S. A.

ENGINEERS' SPECIFICATION INDEX (Continued)

Sarco Co., New York.
Thrush & Co., H. A., Peru, Ind.

TRAPS.

Radiator.

Barnes & Jones, Boston, Mass.
Bishop & Babcock Co., Cleveland, Ohio.
Cashin Co., W. D. Boston, Mass.
Dunham, C. A., Co., Chicago, Ill.
Hoffman Specialty Co., New York.
Ideal Heating Equipment Co., Cleveland, Ohio.
Illinois Engineering Co., Chicago, Ill.
Johns-Manville, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
Mouat Vapor Heating Co., Cleveland, O.
H. W. Nelson Co., Moline, Ill.
O-E Specialty Co., Milwaukee, Wis.
Sarco Co., New York.
Sterling Engineering Co., Milwaukee, Wis.
Stickle Steam Specialties Co., Indianapolis, Ind.
Trane Co., La Crosse, Wis.
Webster & Co., Warren, Camden, N. J.

Return.

American Blower Co., Detroit, Mich.
Barnes & Jones, Boston, Mass.
Cashin Co., W. D., Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Illinois Engineering Co., Chicago Ill.
Johns-Manville, Inc., New York.
Kieley & Mueller, Inc., New York.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Mouat Vapor Heating Co., Cleveland, O.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Simplex Heating Specialty Co., Inc., Lynchburgh, Va.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., La Crosse, Wis.
Webster & Co., Warren, Camden, N. J.
Wright-Austin Co., Detroit, Mich.

Steam.

American Blower Co., Detroit, Mich.
American District Steam Co., No. Tonawanda, N. Y.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Barnes & Jones, Boston, Mass.
Davis Regulator Co., G. M., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Elliott Co., Jeannette, Pa.
Haines & Co., Wm. S., Philadelphia, Pa.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Johns-Manville, Inc., New York.
Kieley & Mueller, Inc., New York.
Klipfel Mfg. Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Patterson-Kelley Co., New York.
Sarco Co., New York.
Stickle Steam Specialties Co., Indianapolis, Ind.
Trane Co., La Crosse, Wis.
Wright-Austin Co., Detroit, Mich.

Vacuum.

American Blower Co., Detroit, Mich.
Bishop & Babcock Co., Cleveland, Ohio.
Cashin Co., W. D., Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Sarco Co., New York.
Sterling Engineering Co., Milwaukee, Wis.
Stickle Steam Specialties Co., Indianapolis, Ind.
Webster & Co., Warren, Camden, N. J.
Wright-Austin Co., Detroit, Mich.

TURBINES (Steam).

Buffalo Forge Co., Buffalo, N. Y.
Sturtevant Co., B. F., Hyde Park, Mass.
Westinghouse Elec. & Mfg. Co. East Pittsburgh, Pa.
L. J. Wing Mfg. Co., New York.

TURBO-BLOWERS.

Sturtevant Co., B. F., Hyde Park, Mass.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

UNDERGROUND PIPE CONDUITS.

American District Steam Co., No. Tonawanda, N. Y.
Hornung, P. C., Chicago, Ill.
Johns-Manville, Inc., New York.
Ric-Wil Co., Cleveland, O.
Wyckoff & Son, A., Elmira, N. Y.

VACUUM CLEANING APPARATUS.

American Radiator Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Mass.

VALVES.

Air (Automatic).

American Radiator Co., Chicago, Ill.
Commonwealth Brass Corporation, Detroit, Mich.
Fulton Co., Knoxville, Tenn.
Haines & Co., Wm. S., Philadelphia, Pa.
Hoffman Specialty Co., New York.
Jenkins Bros., New York.
Klipfel Mfg. Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Powers Regulator Co., Chicago, Ill.
Pierce, Butler & Pierce Corp., New York.

Air Relief.

American District Steam Co., No. Tonawanda, N. Y.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Barnes & Jones, Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Fulton Co., Knoxville, Tenn.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
O-E Specialty Co., Milwaukee, Wis.
Powell Co., Wm., Cincinnati, O.
Scott Valve Mfg. Co., Detroit, Mich.
Sterling Engineering Co., Milwaukee, Wis.
Webster & Co., Warren, Camden, N. J.

Back Pressure.

Griscom-Russell Co., New York.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Kieley & Mueller, Inc., New York.
Klipfel Mfg. Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Scott Valve Mfg. Co., Detroit, Mich.
Stickle Steam Specialties Co., Indianapolis, Ind.

Balanced.

American District Steam Co., No. Tonawanda, N. Y.
Atlas Valve Co., Newark, N. J.
Davis Regulator Co., G. M., Chicago, Ill.
Kieley & Mueller, Inc., New York.
Klipfel Mfg. Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Powers Regulator Co., Chicago, Ill.
Scott Valve Mfg. Co., Detroit, Mich.
Stickle Steam Specialties Co., Indianapolis, Ind.

Blow-off.

Elliott Co., Jeannette, Pa.
Jenkins Bros., New York.
The Wm. Powell Co., Cincinnati, O.

Check.

Grinnell Company, Providence, R. I.
Jenkins Bros., New York.
Kennedy Valve Mfg. Co., Elmira, N. Y.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Powell Co., Wm., Cincinnati, O.
Scott Valve Mfg. Co., Detroit, Mich.

Float.

American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Atlas Valve Co., Newark, N. J.
Davis Regulator Co., G. M., Chicago, Ill.
Grinnell Company, Providence, R. I.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller Co., New York.
Klipfel Mfg. Co., Chicago, Ill.,
McAlear Mfg. Co., Chicago, Ill.
Mason Regulator Co., Boston, Mass.
Stickle Steam Specialties Co., Indianapolis, Ind.

Gate.

American District Steam Co., No. Tonawanda, N. Y.
Grinnell Company, Providence, R. I.
Jenkins Bros., New York.
Kennedy Valve Mfg. Co., Elmira, N. Y.
Marsh Valve Co., Erie, Pa.
Milwaukee Valve Co., Milwaukee, Wis.
Powell Co., Wm., Cincinnati, O.
Scott Valve Mfg. Co., Detroit, Mich.

Globe, Angle and Cross.

Commonwealth Brass Corp., Detroit, Mich.
Grinnell Company, Providence, R. I.
Jenkins Bros., New York.
Kennedy Valve Mfg. Co., Elmira, N. Y.
Marsh Valve Co., Erie, Pa.
Milwaukee Valve Co., Milwaukee, Wis.
Pierce, Butler & Pierce Corp., New York.
Powell Co., Wm., Cincinnati, O.
Powers Regulator Co., Chicago, Ill.
Scott Valve Mfg. Co., Detroit, Mich.

Hydraulic-Operating.

Atlas Valve Co., Newark, N. J.
Kieley & Mueller, Inc., New York.
Klippel Mfg. Co., Chicago, Ill.

Non-Return.

American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Davis Regulator Co., G. M., Chicago, Ill.
Grinnell Company, Providence, R. I.
Jenkins Bros., New York.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
Powell Co., Wm., Cincinnati, O.

Radiator.

American Radiator Co., Chicago, Ill.
American District Steam Co., No. Tonawanda, N. Y.
Atlas Valve Co., Newark, N. J.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Co., Cleveland, Ohio.
Commonwealth Brass Corporation, Detroit, Mich.
Dunham Co., C. A., Chicago, Ill.
Fulton Co., Knoxville, Tenn.
Gorton & Lidgerwood Co., New York.
Ideal Heating Equip. Co., Cleveland, Ohio.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Kennedy Valve Mfg. Co., Elmira, N. Y.
McAlear Mfg. Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Marsh Valve Co., Dunkirk, N. Y.
Milwaukee Valve Co., Milwaukee, Wis.
Powell Co., Wm., Cincinnati, O.
Powers Regulator Co., Chicago, Ill.
Trane Co., La Crosse, Wis.
Scott Valve Mfg. Co., Detroit, Mich.
Simplex Heating Specialty Co., Inc., Lynchburg, Pa.
Sterling Engineering Co., Milwaukee, Wis.
Stickle Steam Specialties Co., Indianapolis, Ind.
Webster & Co., Warren, Camden, N. J.

Reducing.

American District Steam Co., No. Tonawanda, N. Y.
Atlas Valve Co., Newark, N. J.
Davis Regulator Co., G. M., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Johnson Service Co., Milwaukee, Wis.
Kennedy Valve Mfg. Co., Elmira, N. Y.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
Mason Regulator Co., Boston, Mass.
Powell Co., Wm., Cincinnati, O.
Powers Regulator Co., Chicago, Ill.
Atlas Valve Co., Newark, N. J.

Regulating.

American District Steam Co., No. Tonawanda, N. Y.
Fulton Co., Knoxville, Tenn.
Hornung, J. C., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Kieley & Mueller, Inc., New York.
Klipfel Mfg. Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Powell Co., Wm., Cincinnati, O.
Powers Regulator Co., Chicago, Ill.

Relief (Water).

American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
McAlear Mfg. Co., Chicago, Ill.
Powell Co., Wm., Cincinnati, Ohio.

Safety.

American District Steam Co., No. Tonawanda, N. Y.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Jenkins Bros., New York.
Powell Co., Wm., Cincinnati, O.

Stop and Check.

(See Valves, Non Return).

VENTILATING HEATERS

Portable Unit.

American Blower Co., Detroit, Mich.
Buckeye Blower Co., Columbus, Ohio.
H. W. Nelson Co., Moline, Ill.
Nesbitt, John J., Inc., Atlantic City, N. J.
Peerless Unit Ventilating Co., New York.
Stickle Steam Specialties Co., Indianapolis, Ind.
Sturtevant Co., B. F., Hyde Park, Mass.
York Heating & Ventilating Co., Philadelphia, Pa.

(See also Heaters, Portable Unit Air).

VENTILATING SYSTEMS

American Blower Co., Detroit, Mich.
Atmospheric Conditioning Corp., Phila, Pa.
Autovent Fan & Blower Co., Chicago, Ill.
Bayley Mfg. Co., Milwaukee, Wis.
Buckeye Blower Co., Columbus, O.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corporation, Newark, N. J.
Clarage Fan Co., Kalamazoo, Mich.
Ilg Electric Ventilating Co., Chicago, Ill.
Massachusetts Blower Co., Watertown, Mass.
H. W. Nelson Co., Moline, Ill.
Nesbitt, John J., Inc., Atlantic City, N. J.
New York Blower Co., Chicago, Ill.
Peerless Unit Ventilating Co., New York.
Seymour, James M., Newark, N. J.
Skinner Bros. Mfg. Co., St. Louis Mo.
Sturtevant Co., B. F., Hyde Park, Mass.
L. J. Wing Mfg Co., New York.
York Heating & Ventilating Co., Philadelphia, Pa.

VENTILATORS.

Bayley Mfg. Co., Milwaukee, Wis.
Buckeye Blower Co., Columbus, O.
Buffalo Forge Co., Buffalo, N. Y.
Ilg Electric Ventilating Co., Chicago, Ill.
New York Blower Co., Chicago, Ill.
Seymour, James M., Newark, N. J.
Sturtevant Co., B. F., Hyde Park, Mass.
L. J. Wing Mfg. Co., New York.

Mushroom.

Knowles Mushroom Ventilator Co., New York.
Lyon Products Co., Chicago, Ill.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Mass.
York Heating & Ventilating Co., Philadelphia, Pa.

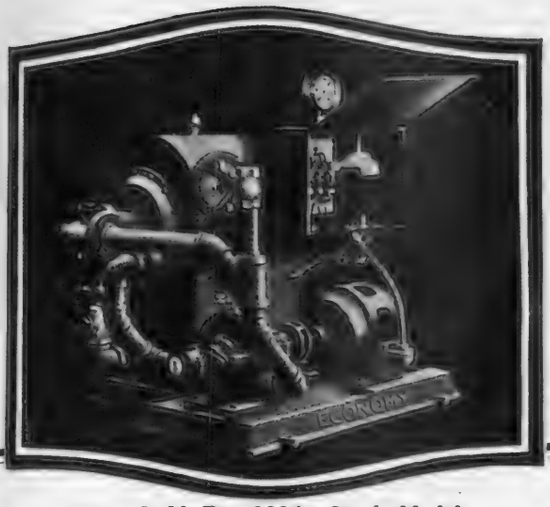
WEATHER STRIPS.

Metal.

Athey Company, Chicago, Ill.
Chamberlin Metal Weather Strip Co., Detroit, Mich.
Higgin Manufacturing Co., Newport, Ky.
Monarch Metal Products Co., St. Louis, Mo.

WELDING MATERIALS.

Linde Air Products Co., New York.
Oxweld Acetylene Co., Long Island City, N. Y.
Prest-O-Lite Co., Inc., New York.



Type C. V. Fig. 2234—Single Model Vacuum Pumps

DEPENDABILITY

This is an essential requirement of all apparatus entering into the equipment of every worth while project.

Economy Centrifugal Vacuum Pumps

embody every requisite of high class equipment. They are well motored with ample reserve power. They never burn out, consequently shut downs are avoided.

They have ample air, water and pressure capacity.

They have longer life than other types.

They maintain their efficiencies.

They are scientifically designed.

They have the best thought of competent hydraulic and heating engineers built into them.

They require less attention and upkeep than other types.

They reduce noise in radiators and piping.

They operate quietly.

They use no more power than other pumps that do the same work.

They are guaranteed for performance and quality.

Representatives in Every Large City

Economy Pumping Machinery Co.

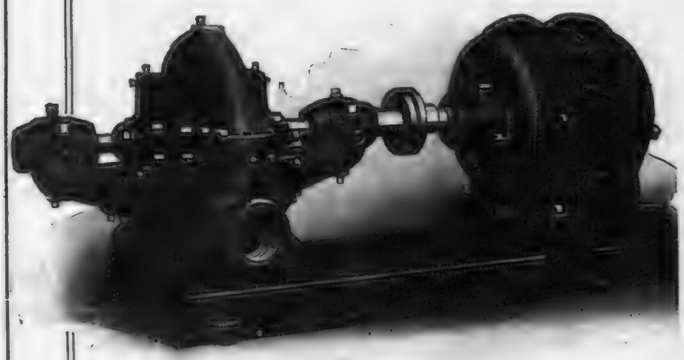
71-122 North Curtis St. CHICAGO

"Buffalo" Class "S" Pumps stay on the job

Air washer manufacturers and heating contractors use more Buffalo Class "S" pumps than any other make.

This is because they have found Buffalo Pumps "long-lived" as well as efficient.

This popularity has enabled us to reach a production large enough to make the price of Class "S" pumps surprisingly low.



1. **Casing: Horizontally divided; mounted directly on base. Interior can be inspected without breaking pipe connections.**
2. **Impeller: Enclosed double suction type, hydraulically balanced.**
3. **Clearance Rings: Brass. Furnished in casing. Easily renewable.**
4. **Shaft Bearings: Ring oiling, horizontally split housings. Brackets bolted to casing, one on each side.**
5. **Thrust Bearings: Collars in each bearing of smaller pumps, marine type on larger sizes.**
6. **Stuffing Boxes: Extra deep. Brass bushed in smaller sizes.**
7. **Glands: Bolted type.**
8. **Water Seals: Brass. Furnished in each stuffing box. Connections cast in casing in smaller sizes.**

We are glad to have you compare specifications of Buffalo Pumps with any others.

Bulletins on request.

Buffalo Steam Pump Company

480 Broadway BUFFALO, N. Y.

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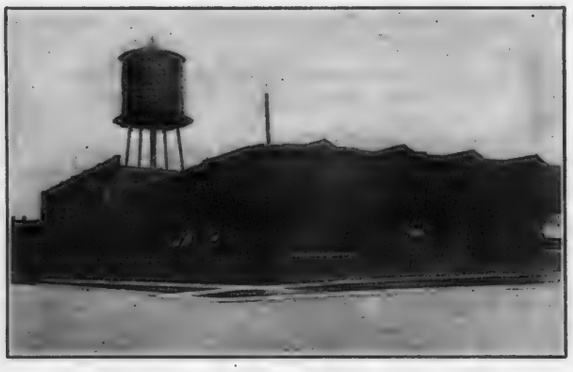
Save Coal—Prevent Condensation

INSULATE ALL ROOFS



ABOVE—DELTA STAR ELECTRIC CO.
Chicago, Ill. Insulated with 1" Lith.
Arch. & Eng.—Frank D. Chase, Chicago

Save Radiation Surface

ALWAYS USE INTERNAL CONDUCTIVITIES, not air to air conductivities when figuring proper thickness for roof insulation. ASK US WHY?

Union Fibre Co., Inc.

Engineers and Manufacturers
WINONA, MINN.

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Gurney

Sectional Boilers Heavy Duty Type of the 900 Series

Steam and Water

No. 949 STEAM BOILER
Also for Water

The largest size of the 900 Series is our No. 949 Steam Boiler (also for Water), the heavy duty type.

In spite of its size and capacity, this 72½-inch high boiler is easily erected, and where head room is limited it will meet every requirement. It may be noted from the illustration how compact the boiler is when installed.

The No. 949 type has a grate area of 21.84 sq. ft. as compared with 11.21 for No. 945, the smallest of the 940 series. With a rating of 6000 for steam and 9900 for water, this No. 949 type is well adapted for the large class of heavy duty work.

There is a Gurney Boiler for every requirement, and they can be relied upon for economy and satisfaction. They are made of the highest grade of pig iron, give long and continuous service, and embody many exclusive features.

Send for Catalog

GURNEY HEATER M'F'G COMPANY.

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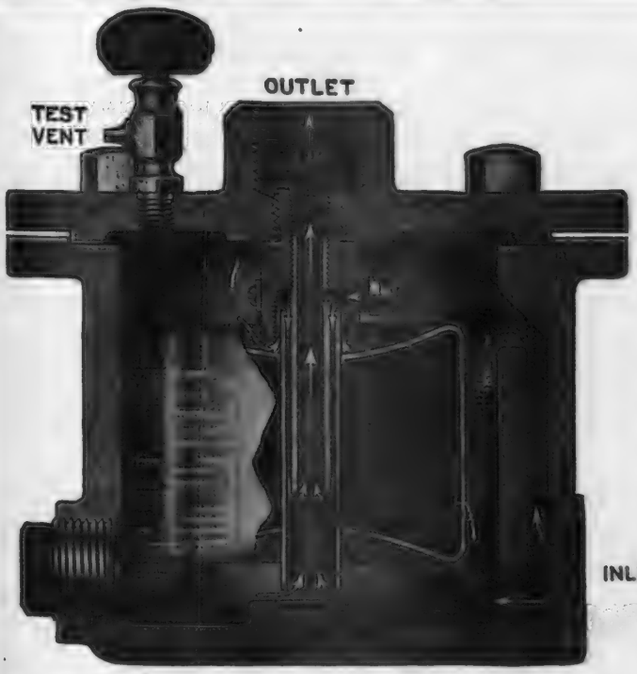
108 North 17th Street



MARSH

DUPLEX WATER SEAL LOW PRESSURE

BLAST TRAP

for direct or indirect coils or any location where large quantities of water are to be discharged

Operates automatically either with or without mechanical suction on return line.

No complicated parts to stick or get out of order.

No small openings to clog up with sediment or scale.

Free passage of water—rapid and steady vent of air and passes no steam.

Combined action of flotation for water and all metal thermostatic vent for air together with relief of air through water seal makes the ideal trap for heavy service.

Adjusted and tested at factory and shipped ready for installation, to work automatically from below atmosphere on up to 25 pounds steam pressure.

We Invite Correspondence

JAS. P. MARSH & CO., 118-124 South Clinton Street, Chicago

FOUNDED 1865

Manufacturers of Radiator Traps and Specialties—Automatic Air Valves and Vents
Indicating and Recording Gauges

Agents for Great Britain and Ireland: Chatterton & Co., 30 Fetter Lane, E. C. 4, London
Agents for Dominion of Canada: Taylor-Forbes Co., Ltd., Guelph, Ontario

Front Fired Pacific Boiler

Rear Fired Pacific Boiler

Rotary Burner Pacific Boiler

A Pacific Boiler—

for Every Oil Burner Installation

With Pacific Oil Fired Boilers you are not restricted to one method of firing nor to one type of oil burner. Pacific Boilers are adaptable for use with any type of oil burning equipment and can be fired from the rear as well as from the front. An exclusive feature of the Pacific design makes this possible.

Pacific Oil Fired Boilers have every feature necessary to burn oil economically and efficiently. The higher, wider, and longer firebox gives as high as 50% more combustion area—plenty of space to properly atomize and completely burn the oil. The long fire travel permits the heat produced to be used in generating steam and not wasted up the stack.

Furthermore, with the Pacific you have the advantage of changing from oil to coal or vice versa in a few hours' time.

A catalog which completely describes Pacific Oil Fired Boilers will be sent on request.

GENERAL BOILERS COMPANY, *Waukegan, Illinois*

BRANCH OFFICES IN PRINCIPAL CITIES

STEEL HEATING BOILER · PACIFIC · WAUKEGAN ILLINOIS · TRADE MARK REG. U.S. PAT. OFF.

PACIFIC

STEEL HEATING BOILERS

KEWANEE

HEATS THE LARGEST
APARTMENT
IN CHICAGO

SHERIDAN BROMPTON
CO-OPERATIVE APARTMENTS
CHICAGO, ILLINOIS
Comprising 162 Apartments

Architects - - - Rissman and Hirschfeld, Chicago
General Contractor - - Avery Brundage, Chicago
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INSTALLED THREE
No. 423 KEWANEE PORTABLE
FIREBOX BOILERS
Radiation Rating 25,000 Feet Each
and used
KEWANEE RADIATORS
42,000 Square Feet Direct Surface

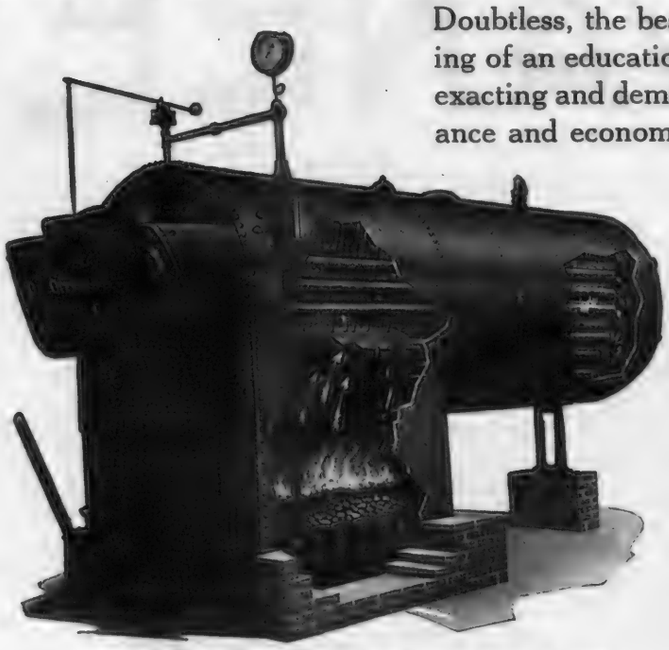
KEWANEE BOILER COMPANY
KEWANEE, ILLINOIS

BRANCHES IN
ALL PRINCIPAL
CITIES

STEEL HEATING BOILERS, RADIATORS, WATER HEATERS, TANKS AND WATER HEATING GARBAGE BURNERS

Evidence of Boiler Efficiency

Doubtless, the best test of Boiler Efficiency is in the heating of an educational building, where the requirements are exacting and demand strict compliance both as to performance and economy.



Built of Steel, in Accordance with the A. S. M. E. Code

The widespread preference for Oil City Boilers by the educational institutions of the country is evidence of confidence in Oil City service. This same nation-wide confidence prevails in industry.

Get the facts about Oil City Boilers and you will know why they are preferred.

Let us send Catalog H-9

OIL CITY BOILER WORKS
OIL CITY, PA.

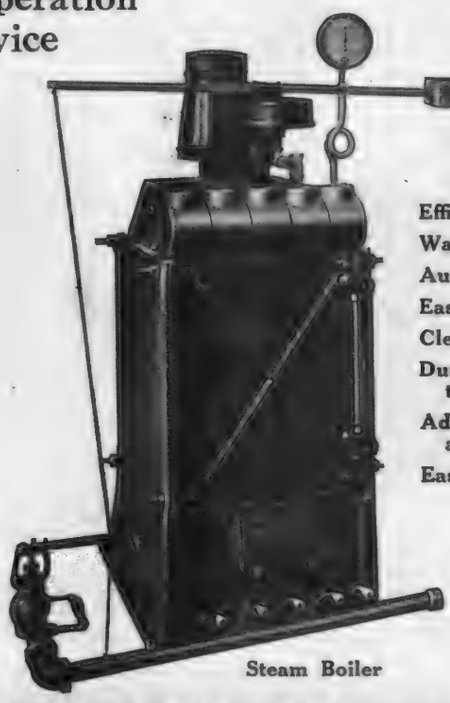
ATLANTA BALTIMORE BUFFALO CHICAGO CINCINNATI DENVER DETROIT INDIANAPOLIS LOS ANGELES NEW YORK PHILADELPHIA PITTSBURGH

UNIVERSAL GAS and OIL BOILERS

Thousands of our gas boilers in operation and all giving satisfactory service

The Universal Gas and Oil Boiler Completely Assembled

Water Boiler



Steam Boiler

- Efficiency Burners
- Water Tube Sections
- Automatic Control
- Ease of Attendance
- Cleanliness
- Durability of Construction
- Adaptable to both Gas and Oil
- Easily Cleaned

UNIVERSAL SMOKELESS BOILER CO., RAVENNA, O.

You can make money—and save your clients money—by installing

Wolff Draft Conditioners

This group of Chicago buildings is on 67th Street, facing Jackson Park. In the entire row which is three blocks long, every building—except one—is equipped with Wolff Draft Conditioners.

More than 5000 successful installations in the City of Chicago prove that Wolff Draft Conditioners *actually pay for themselves in a very short time.* By properly regulating the draft—according to what is actually needed—they save fuel, and improve heating conditions.

Some of Chicago's most prominent owners have equipped *every building they own* with Wolff Draft Conditioners.

It makes no difference how scientifically a boiler is designed: If it is not properly operated it can't produce its greatest efficiency. **Wolff Draft Conditioners make it possible for even an unskilled man to get the greatest possible efficiency from a boiler.**

We can show you letters from boiler manufacturers, from architects, heating engineers, and building owners, endorsing everything we have ever said.

Will you let us prove this to you?

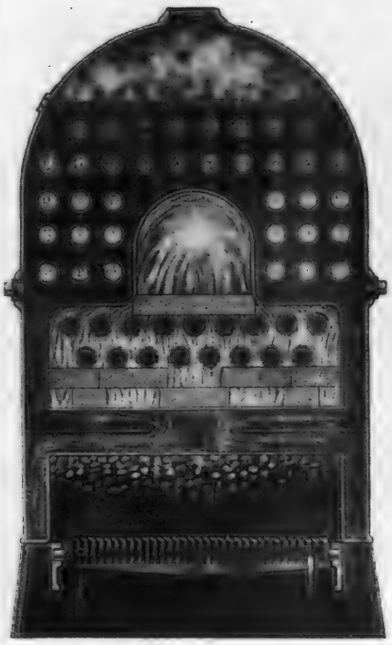
Heating Contractors can make money selling them.

Wolff Coal Saver Co.

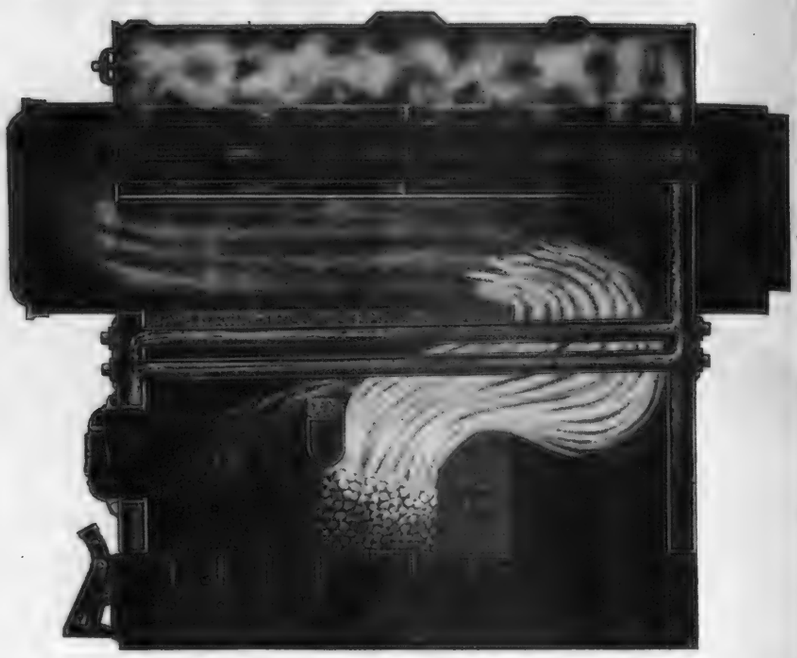
1336 West Congress St., Chicago

The FROST
Ross Steel Heating Boiler

One-Piece Construction—Patented



Front View



Side View

Made for heating any size or type of building

THE DUTY of the boiler is to extract the heat from the fire and deliver it to the radiators.

THE EFFICIENCY of a boiler measures the proportion of available heat extracted.

CONSIDER the high efficiency of central power station boilers, which is obtained by absorbing the radiant heat from the fire by high velocity, and complete circulation of the water through water tubes.

NOTE how the Frost-Ross Boiler by these same means is able to show such high economy and capacity in a small volume.

USUAL huge coal bin and large boiler room not required—JUST install a Frost-Ross Boiler and save the extra space.

WRITE for catalogue showing this wonderful boiler more in detail.

The Frost Manufacturing Co.

Established 1851

Main Office and Works
Galesburg, Ill.

Chicago Sales Office
112 West Adams St.

INTERNATIONAL

ECONOMY BOILERS

Large firepot holds plenty of fuel.

Positive circulation of gases and water.

Maximum generation of heat contained in fuel.

Heat absorbing surfaces designed for most effective use of heat.

Steam dome and positive circulation of water arranged to deliver dry steam without a header.

"I chose INTERNATIONAL Economy Boilers to sell to *my* customers because they have individual refinements that make them distinctively efficient heating units and give my salesmen something more to sell than just boilers."

That's another INTERNATIONAL dealer speaking,—one who has been selling Economy Boilers for years.

His boiler customers are satisfied users of good heaters that secure:—*The maximum of heat contained in fuel.*

SUPPORTING MEMBER

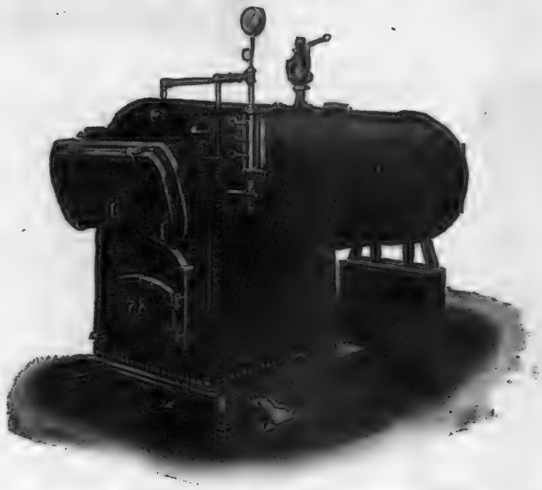
INTERNATIONAL HEATER COMPANY

UTICA, NEW YORK

Branches and Warehouses at:

NEW YORK CHICAGO CLEVELAND DETROIT NASHUA, N. H.

AMES
Firebox Heating Boilers



Ames Firebox Heating Boiler with Plain Furnace

Built with Plain and Downdraft Furnaces. Incorporating the Latest and Most Advanced Ideas in Boiler Design and Construction.

We also build a complete line of Horizontal Tubular, Upright and Empire Boilers for Heating and Power Requirements.

Bulletins with complete details mailed on request.

Empire Return Tubular Portable Boiler

AMES IRON WORKS

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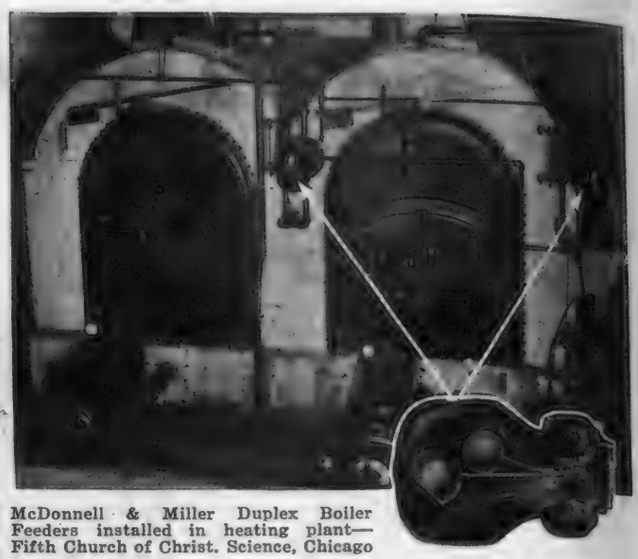

McDonnell & Miller Duplex Boiler Feeders installed in heating plant—Fifth Church of Christ. Science, Chicago

Better Safe Than Sorry!

THE measure of a protective device is not its price but its *dependability.*

The McDonnell & Miller Duplex Water Feeder maintains a normal water line without manual operation—it prevents cracked sections and burned boilers—it prevents flooded boilers and consequent loss in efficiency.

But more than that—*it can be depended upon absolutely.*

Indifferent protection is *no protection,* and its price is far beyond its original cost.

When you buy protection for your boilers, buy McDonnell & Miller Duplex Water Feeders. They are our only item of manufacture. We have concentrated all our facilities upon making them perfect. *We* can't afford to make them otherwise—*you* can't afford to have any but the best.

Let us tell you why. Send for Bulletin H-3.

McDonnell & Miller

"Doing One Thing Well"

The Only Exclusive Manufacturers of Water Feeders

General Offices
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M&M WATER FEEDER

Eastern Warehouse Stock
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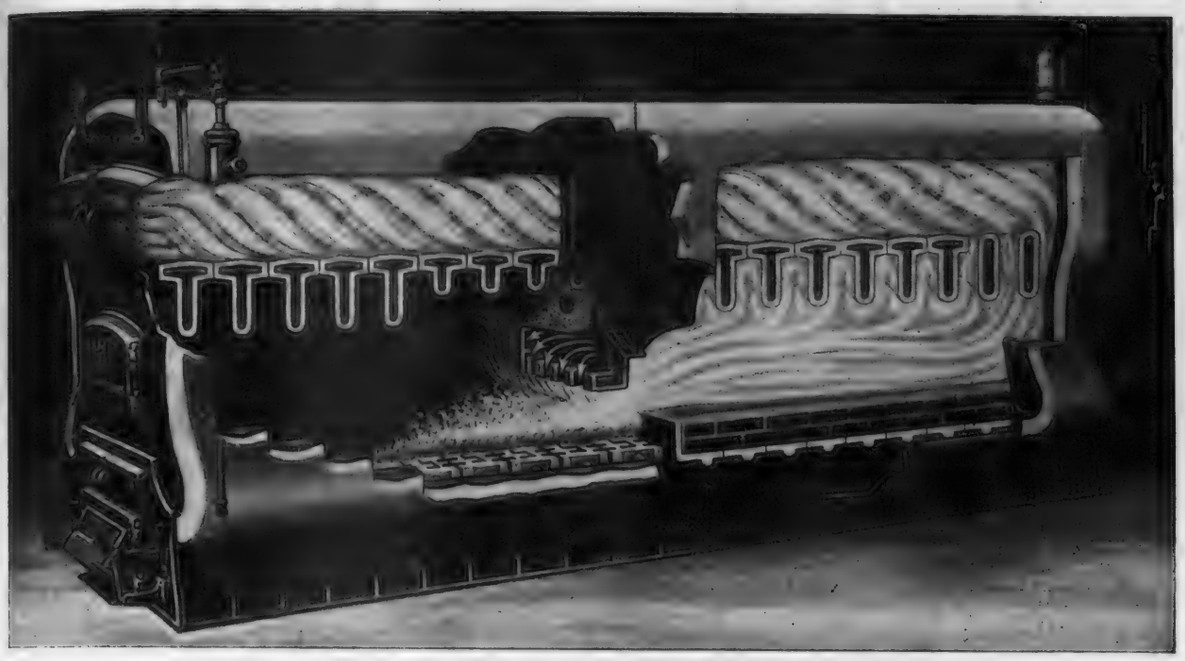
NEW YORK



Cutaway View of Utica-Imperial SUPER-SMOKELESS Boiler

UTICA-IMPERIAL
SUPER-SMOKELESS BOILERS

Insurance Against the Fuel Situation!

A recent improvement put the Air Regulation under easy control from the front of the boiler.

Exterior View of Boiler

Utica-Imperial SUPER-SMOKELESS Boilers will not only burn soft coal and fuel oil with the utmost efficiency, but will, when required, utilize other types of available fuel, thus protecting the owner against any emergency, and providing an insurance against the fuel situation. In these days of high fuel costs, it is of the utmost importance that heating boilers should be able to utilize the cheapest available fuel. Utica-Imperial SUPER-SMOKELESS Boilers will burn even the cheaper grades of soft coal not only smokelessly but with maximum efficiency, and will utilize other fuels with great economy and efficiency.

Manufactured by the

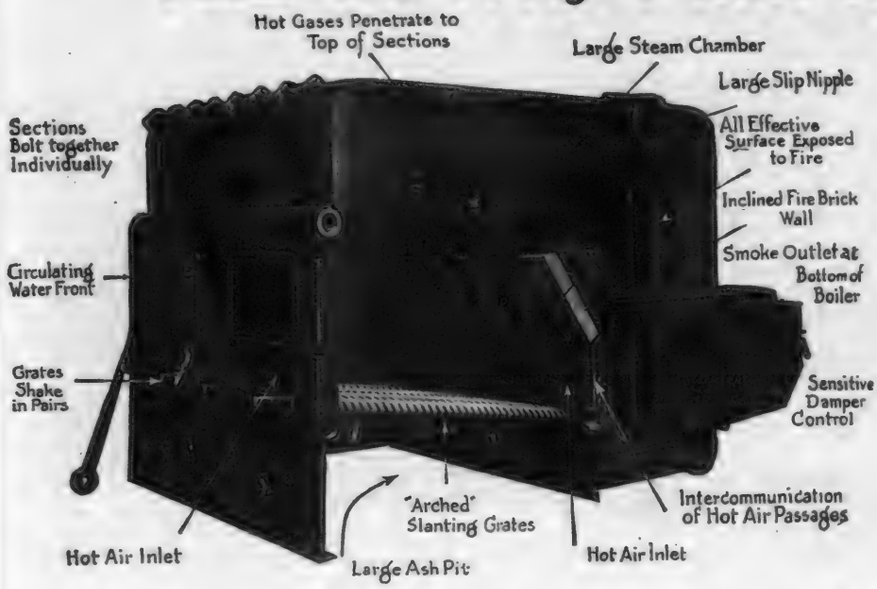
UTICA HEATER COMPANY

UTICA, NEW YORK

CHICAGO CLEVELAND NEW YORK

Sales Offices in the Principal Jobbing Centers

Ask Us Why Push Its Sale


Hot Gases Penetrate to Top of Sections
Large Steam Chamber
Large Slip Nipple
All Effective Surface Exposed to Fire
Inclined Fire Brick Wall
Smoke Outlet at Bottom of Boiler
Sensitive Damper Control
Intercommunication of Hot Air Passages
Hot Air Inlet
Large Ash Pit
"Arched" Slanting Grates
Hot Air Inlet
Grates Shake in Pairs
Circulating Water Front
Sections Bolt together Individually

Complete sale does not stop with boiler installation.

There is a fair profit on the Niagara and certain satisfaction to your customers.

No expensive alterations and no makeshift and inefficient arrangements. This boiler is made right, and designed to fit all houses easily.

The low water line feature means smaller mains, better performance, and surer adaptability to any basement.

No trouble in selling this because it is what your customers WANT, and ought to have.

Catalog 23 gives construction details. Send for it.

NIAGARA RADIATOR & BOILER COMPANY

General Office and Factory—North Tonawanda, N. Y. Branch Office and Factory—Chicago, Ill.

NIAGARA LOW WATER LINE SMOKELESS **BOILERS**

Heat Your Home Better with Gas

No. 3 System without Thermo Valve and By-Pass

No. 3 System with Thermo Valve and By-Pass

The idea of burning gas for heating is now being considered by every home owner, as the economical FRANKLIN BURNER can be installed for the small sum of about $35.00, which price is within the reach of everybody.

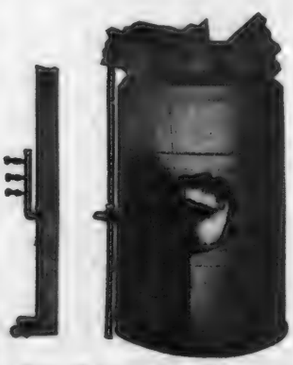
The Franklin New Improved Quick Removable Gas Burner eliminates the necessity of installing an expensive separate gas furnace, for their present hot water, steam boiler or hot air furnace can be converted into a combination gas and coal heating apparatus immediately.

Gas with the Franklin is quick, clean, convenient, safe and positively economical. Burners can be removed or reinstalled in one minute without tools. Ideal for Fall and Spring heating.

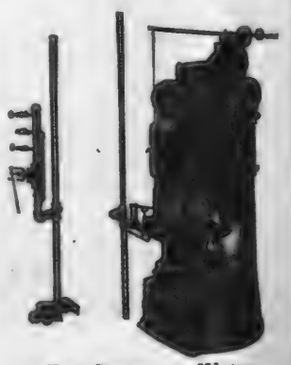
$10.00 to $15.00 profit on every installation.

We will furnish a complete No. 3 Unit System for $18 and will furnish a complete window display with same so you can show your customers what the burner will do.

Act now before the first cold spell. Write for Catalog.



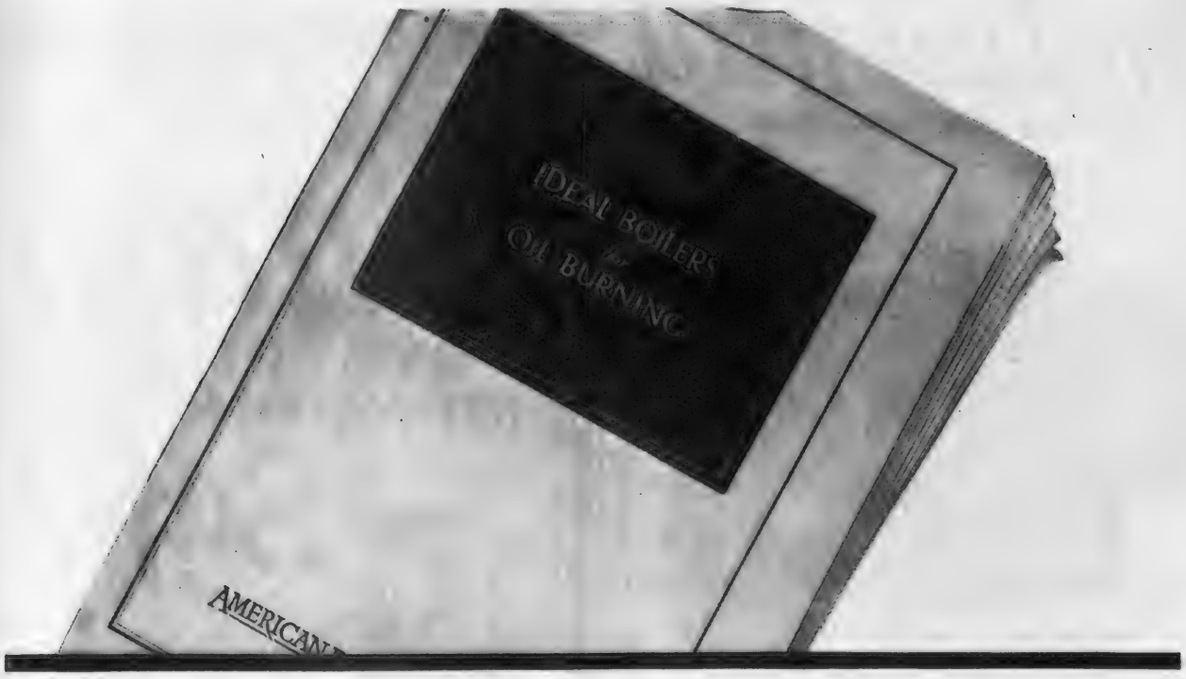
For Warm Air Furnace



For Steam or Water

Franklin Gas Burner Mfg. Co.

Vine and Mitchell Aves. CINCINNATI, OHIO



"Can IDEAL Boilers *burn oil?*"

"What special equipment does the Company furnish for oil burning?"

"What is the performance of IDEAL Boilers, oil-fired?"

"Can IDEAL Type A and the larger water tube IDEAL Boilers be used effectively with oil for fuel?"

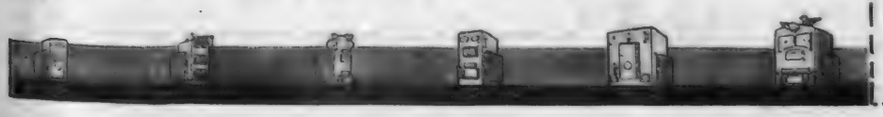
SO MANY INQUIRIES have come to us concerning this increasingly important question that we have prepared in book form a practical and thorough analysis of the entire subject of oil burning as applied to IDEAL Boilers.

It tells the story completely. We will gladly mail a copy without cost or obligation on request to the address below. The coupon is for your convenience. Just fill it in and mail it today.

AMERICAN RADIATOR COMPANY

SALES OFFICES IN ALL PRINCIPAL CITIES

IDEAL BOILERS AND AMERICAN RADIATORS FOR EVERY HEATING NEED



AMERICAN RADIATOR COMPANY
Dept. T232, 1807 Elmwood Avenue
Buffalo, New York

Without obligation, send me your new book, "IDEAL Boilers for Oil Burning."

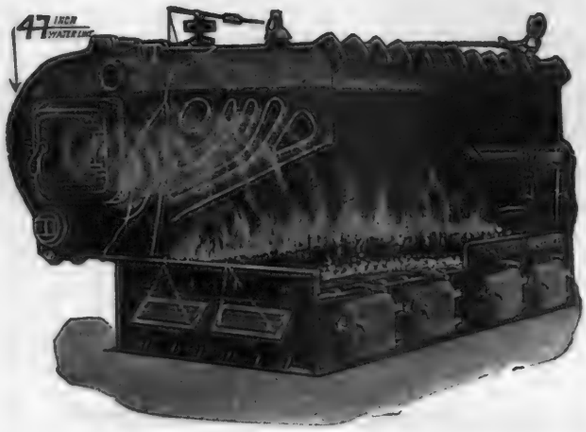
Name.....

Address.....

Town, State.....

Continental

BOILERS AND RADIATORS



Side Feed and Easy Firing with Continental Low Water Line Boilers

SIDE feed is a Continental feature appreciated by the men who do the firing.

A boiler that is easy on the man who shovels the coal is invariably easier on the man who foots the bills.

Continental side feed gives perfect fire control. With grate bars operating in series of twos and threes, any part of the grate surface needing attention can be shaken without disturbing the balance of the fire and shaking live coals into the ash pit.

Continental Low Water Line Boilers are built in regular and smokeless types to burn any kind of fuel. They are designed for highest boiler efficiency under actual working conditions. With low 43 and 47 inch water lines they meet extraordinary as well as ordinary installation requirements.

They are dependable—their ratings haven't been changed in twelve years. Every boiler is set up, and double-tested under pressure before shipment.

It's good business to know the Story of Continental Boilers and Radiators—write for it.

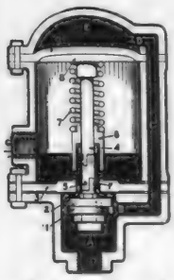
Continental Heater Corporation
Dunkirk, N. Y., U.S.A.

BUILT FOR BETTER HEATING

Thrush

SYSTEM OF HOT WATER HEATING

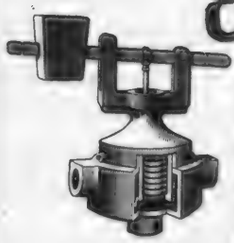
Safe!



Safety factor of ten to one

Safety should be one of the prime considerations in any closed system of hot water heating. Thrush Differential Pressure Relief Valve conforms to 1925 A.S.M.E. code and is absolutely dependable.

Economical



Always on the job

Thrush Automatic Temperature Control insures economical fuel consumption and increased heating efficiency. Saves many steps and lengthens firing periods.

Convenient

It provides the greatest possible amount of heating satisfaction—a home comfortably warm with very little personal attention required.

and easy to sell!

HATHRUSH & CO.

PERU, IND.

PAGE BOILERS

"The Distinguished Service Line"

Page Boilers are a good investment—from the viewpoint of the engineer and contractor because they "do the job well," generate heat quickly, without forcing, and insure a satisfied customer—from the viewpoint of the owner because they are easy on the coal pile and outlast the building in which they are installed.

The Volunteer round boiler will take care of your small house heating problems. The ashpit allows ample depth for accumulation of ashes—the triangular revolving grate bars, each bar a shaker bar and interchangeable, are easily operated and superior to any other style of grate. The firepot is a single section, with crownsheet cast integral with the walls of the section, forming the most effective and valuable heating surface, directly over the fire. The sections and dome are arranged to absorb from the gases the greatest possible percentage of heat units—and the liberal steam space in the dome insures dry steam and provides an ample reserve.

No. S-409 Monarch Steam Boiler

No. 23 C Volunteer Steam Boiler

The Monarch square boiler, for larger work, is an assemblage of heavily cast sections, designed to provide a firebox of ample size and depth to insure results, in which is fitted a cradle supported grate, resting on rollers, which cradle may be entirely withdrawn from the boiler if the grate requires attention. The liberal areas of heating surface above the grate is designed to produce an abundance of dry steam or to quickly circulate hot water. A feature of this heating surface is the long three-way fire travel, three times back and forth, each time on a different level, passing the gases of combustion through long heat-absorbing corridors, until the heat units have been utilized to the greatest possible degree.

Specify the Volunteer and Monarch and assure your clients of heating satisfaction, the result of the care and the more than half century's manufacturing experience that goes into the design and production of Page Boilers.

For All Fuels—
Hard Coal,
Soft Coal,
Gas or Oil.

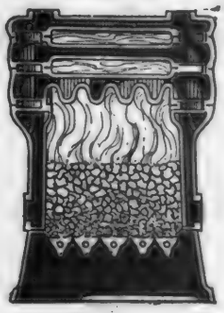
Send for Catalogue 51. It gives you in concise form, complete specification data.

THE WM. H. PAGE BOILER CO.

58 West 40th Street
NEW YORK

BOSTON **CLEVELAND**
PHILADELPHIA **MEADVILLE**

Established 1856 **Incorporated 1877**



Larger Heating Surface

Because the Push Nipples are on the Outside

BURNHAM Boiler design has placed the push nipples on the outside so they will not take up space on the inside. For each nipple on the outside there is an extra corrugation on the inside.

The straight upward sweep of the heat, to the larger corrugated heating surface, means *quick* heating and more heat per pound of coal. It's only *one* of the business building points in Burnham Boilers.

Catalog will show you. It also shows other members of the Burnham Boiler Family. There's a Burnham for every purpose—each one designed for the purpose. Write us for catalog.

Burnham Boiler Corporation

IRVINGTON, N. Y.

Representatives in all Principal Cities

Canadian Offices: Harbor Comm. Bldg., Toronto 124 Stanley St., Montreal

Combination heating in homes

Gasteam Radiator in Dining Room of a New York Apartment

for living room and dining room

IN combination heating systems steam heat is available as wanted, for living rooms and dining rooms at night, or in the spring and fall when the main heating plant is shut down.

The landlord need not run the heating plant when only a little heat is required in a few rooms for a few hours each day.

The occupants appreciate the fact that they are not being charged for a lot of heat that they neither need nor want—but still have steam heat in living room and dining room, when they want it.

Combination heating permits of starting the boiler a month or two later in the fall and shutting it down a month or two earlier in the spring.

The cost of installation is negligible in comparison with the savings and convenience.

JAMES B. CLOW & SONS

534-546 S. Franklin St., Chicago

Sales Offices in Principal Cities

{Each Radiator an Independent Steam Heating Plant}

CLOW

GASTEAM — GASWATER

A Heating Plant Data Book for Architects

Titusville Catalog no. 85A

Every architect and engineer interested in power and heating boilers should have a copy of Titusville Bulletin No. 85A. It describes in detail all of the various types of Titusville Firebox Boilers and gives operating data that will prove of real value and interest.

TICO *RETURN TUBULAR FIREBOX* Boilers

Built to A.S.M.E. Code requirements for power or heating.

Economical—easy to fire —sturdily built.

THE TITUSVILLE IRON WORKS COMPANY

TITUSVILLE, PENNA.

New York
152 West 42nd Street
Detroit, Mich.
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SALES OFFICES:
Pittsburgh, Pa.
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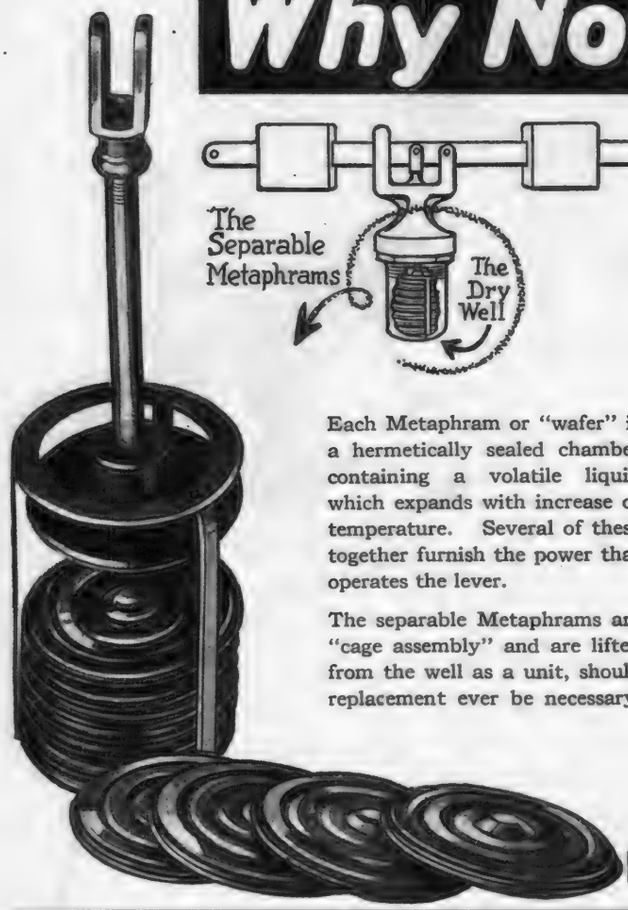
TITUSVILLE IRON WORKS CO.,
Titusville, Penna.
Send us one of your Catalogs No. 85-A
Company .....
Address .....
Title .....

Why Not Hot Water?



Each Metaphram or "wafer" is a hermetically sealed chamber containing a volatile liquid which expands with increase of temperature. Several of these together furnish the power that operates the lever.

The separable Metaphrams are "cage assembly" and are lifted from the well as a unit, should replacement ever be necessary.

A regulator is standard trimming on a steam boiler. Why not on hot water?

A steam installation would not be complete without a regulator. Everyone knows that.

Then why should you omit it on a hot water job? It's just as important for economical operation.

You can make hot water installations more profitable, more efficient and more satisfactory by adding a

METAPHRAM DAMPER REGULATOR

There is a fertile field for you, selling and installing this sensitive but positive, much needed regulator—on new or old installations.

Order from your jobber or direct.

Write for circular.

NATIONAL REGULATOR CO.
2301 KNOX AVENUE CHICAGO

European Office: A. J. Assheton, 18 St. Thomas St., London, S.E.1, Eng.

THE
W.D. CASHIN CO.
THERMOFLEX

Low Pressure Automatic Boiler Feeder

AUTOMATIC POSITIVE NON-FLOODING

Is fully described in bulletin No. 50. Let us send it to you. Is also made with an overflow feature if desired for abnormal cases.

WHY NOT?
ORDER ONE FOR TRIAL

MANUFACTURED BY

W. D. CASHIN COMPANY

35 HARTFORD STREET :: :: BOSTON, MASS.

Thatcher Round Boilers are conservatively rated on the basis of maintaining a constant temperature of 70 degrees in zero weather. No forcing is necessary.

Follow Up!

THATCHER is plowing the ground for you with an intensive national advertising campaign. Follow up your prospects—a little effort will turn them into buyers. Get them signed up before the cold weather starts. No matter how busy you are, there's always time to make extra sales and add to your profits. We are always glad to cooperate with you in boosting business in your locality.

Send in the coupon at once for full information on how we give you valuable help in making sales. Act today—while there's still time.

THE THATCHER COMPANY

Formerly Thatcher Furnace Co.
Since 1850

21 W. 44th Street, New York, N. Y.

39-41 St. Francis Street, NEWARK, N. J.

341 N. Clark Street Chicago, Ill.

THATCHER

BOILERS-FURNACES-RANGES

THE THATCHER COMPANY,
39-41 St. Francis St., Newark, N. J.

Please send me your 1925 Boiler Catalog and full details about your Sales Helps for Dealers.

NAME .....

ADDRESS .....

.....

Coal Bills go Down *when the* SARCO goes in

Keep condensate out of the radiators and you greatly increase the heating efficiency of all the fuel consumed.

The Radiator Trap Sarco automatically expels condensation without the loss of any of the heating medium.

It prevents noisy, airbound, water-hammering radiators and ensures maximum heating effect all the time.

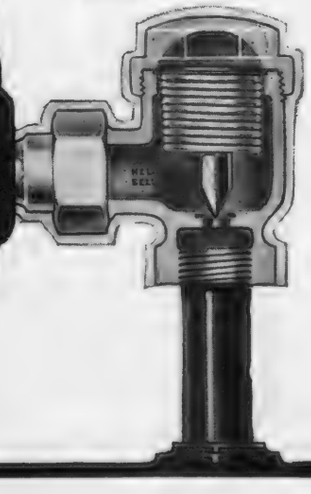
Radiator Trap SARCO

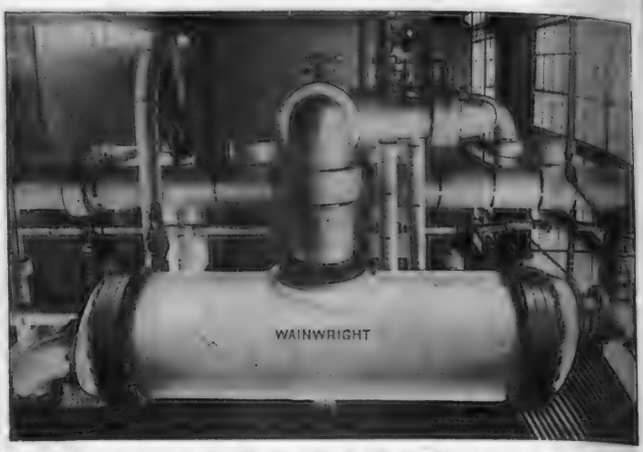
is adjusted at the factory for vacuum and steam pressures up to 20 lbs. It has heavy, substantial brass castings, free from blowholes and defects.

Is easy to clean. Elements can be lifted out without affecting the adjustment, as they are not attached to the body or cap.

Booklet P-127 gives additional features. Send for it.

SARCO CO., Inc.
231 BROADWAY, NEW YORK CITY
Buffalo Chicago Cleveland
Boston Detroit Philadelphia
Peacock Bros., Ltd., Montreal





Hot water heating system heater installed in the plant of the American Fabric Co., Bridgeport, Conn. This factory supplies hot water heat to over sixty homes owned by the Bridgeport Housing Corporation.

A Use For Exhaust Steam

OVER the greater part of the U. S., heating is required in all buildings for six to eight months of the year. Low pressure exhaust steam is the cheapest source of heat for this purpose. A hot water heating system can use low pressure steam or even carry a considerable vacuum in warm weather. In many cases low first cost and high operating efficiency may be combined by using the heater as a heater during the winter, and as a condenser during the summer.

The temperature of a building heated by hot water is easily regulated from a central point, and there is no temptation to waste heat by opening windows rather than regulating the individual radiators.

The drips or condensate are all available at one point, uncontaminated with air or foreign matter, for use as boiler feed water.

Hot water may be piped to widely scattered buildings with low pressure loss and less expense than low pressure steam.

For further details, write for Bulletin H-6

WHEELER
CONDENSER & ENGINEERING CO.
Works. **CARTERET, N.J.**
and NEWBURGH, N.Y.
Main Office—149 Broadway, New York City

The Three Patricks
of the G. S. Blodgett Co.,
Burlington, Vt.
to left, J. H. Patrick
centre, R. L. Patrick
right, J. S. Patrick

Three generations

who have used and recommended H. B. Smith Heating Equipment

WHEN a grandson uses and recommends the products made by the organization his father and his grandfather before him had represented, it is pretty conclusive proof both of the worth of the product and the progressiveness of the company making the product.

J. S. Patrick began to recommend and install H. B. Smith Heating Equipment.

R. L. Patrick joined his father as a heating contractor. He, too, recommended and installed H. B. Smith Heating Equipment.

J. H. Patrick, of the third generation, joined his father and grandfather in the G. S. Blodgett Company.

All three are still using and recommending H. B. Smith Heating Equipment.

They have built up a successful business in Burlington, Vt., of which they are justly proud. So are we. Because, for a business to be successful through three generations, means that the products and policies must **always** have been the best. They have **always** used and recommended H. B. Smith Heating Equipment. Such permanent trade connections as this give us our greatest satisfaction.

You are invited to draw your own conclusions.

The Truth About Boiler Ratings

To help you acquaint your clients with the truth about boiler ratings, we have recently issued a 16-page booklet called, "Guaranteed Heating Satisfaction at Minimum Cost." It thoroughly covers the subject of boiler ratings and explains, in an easily understandable way, why the inability to keep warm in extreme cold weather is proof of daily fuel waste. It will help you to convince your clients why they should be careful to get a fairly rated boiler of the proper size. Your copy is free. For your convenience in ordering it, please use the coupon below.

THE H. B. SMITH COMPANY
Dept. J-2 **Westfield, Mass.**

Sales Offices and Warehouses at
WESTFIELD BOSTON NEW YORK
PHILADELPHIA CLEVELAND

THE H·B·SMITH
BOILERS & RADIATORS
Used in fine homes and buildings since 1860

THE H. B. SMITH COMPANY,
Dept. J2, Westfield, Mass.

Gentlemen:—

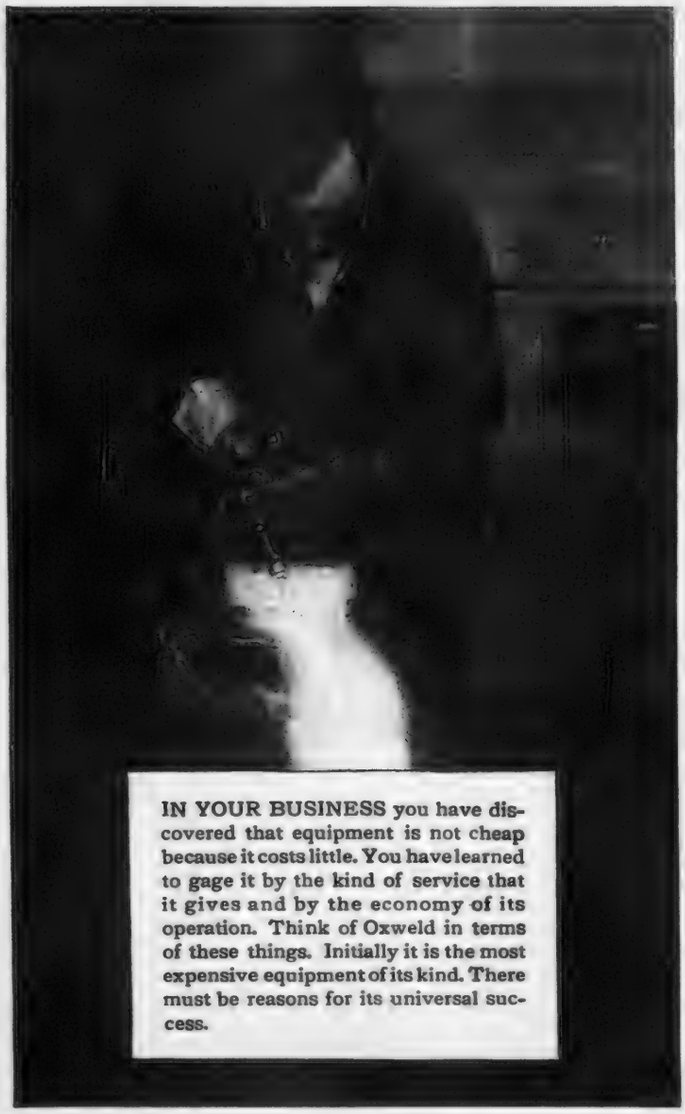
Send a copy of your new booklet on Boiler Ratings to:

Name .....

Street .....

City..... **State**.....

Is Oxweld equipment too expensive?



IN YOUR BUSINESS you have discovered that equipment is not cheap because it costs little. You have learned to gage it by the kind of service that it gives and by the economy of its operation. Think of Oxweld in terms of these things. Initially it is the most expensive equipment of its kind. There must be reasons for its universal success.

THE QUESTION is a legitimate one, especially as Oxweld is the highest priced welding and cutting equipment on the market. One of the soundest reasons for purchasing any equipment is that it is owned by a large majority of companies engaged in a highly competitive business. Such an endorsement for Oxweld comes out of the fact that there are over 575 scrap metal dealers who own Oxweld equipment.

The scrap metal business is proverbially a business of small margins. Dealers must buy and sell intelligently. Above all, they must handle the scrap economically. Their cutting tools and equipment must be serviceable.

In this kind of business over 575 dealers have purchased the most expensive equipment of its kind. This is, in effect, 575 endorsements of the statement that Oxweld is the most serviceable as well as the most economical cutting equipment on the market.

Oxweld Acetylene Company

LONG ISLAND CITY, N.Y.
Thompson Ave. & Orton St.

CHICAGO
3642 Jasper Place

SAN FRANCISCO
1050 Mission Street

Oxweld

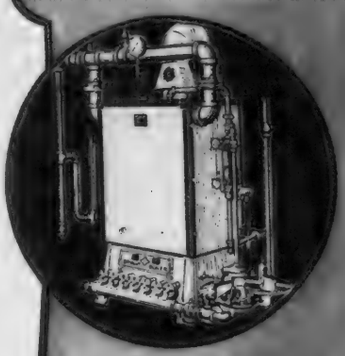
WELDING AND CUTTING APPARATUS

WORLD'S LARGEST MANUFACTURERS OF WELDING AND CUTTING EQUIPMENT

Gas Heating in Every Home on this Baltimore Street

No dread of winter in these homes. No dirt, ashes, soot, oily odors, nor vapors. No fuel storage, nor worry, nor bother—every house on the street is equipped with a Bryant Automatic Gas Heating Plant.

The Bryant Sales and Engineering Offices will gladly work with you in planning the installation of these reliable, carefree heating systems.



BRYANT HEATING

for Hot Water, Steam Automatic GAS Vapor *or* Warm Air

THE BRYANT HEATING & MFG. COMPANY
17854 St. Clair Ave., Cleveland, Ohio
Branches in Principal Cities

A few more well-known architects who specify Bryant Automatic Gas Heating.

Harry Hake, Cincinnati, O.
Jesse L. Bowling, St. Louis, Mo.
Herman J. Gaul, Chicago, Ill.
Schenck & Williams, Dayton, Ohio
E. G. Blanke, Baltimore, Md.
Weidner & Sweeney, Casper, Wyo.
The G. W. Huntington Arch. Co., Denver, Colo.

Some of the Features of the EverHot AUTOMATIC WATER HEATER

1—Heating Surface.
2—Burner.
3—Thermostat.
4—Absence of Condensation.
5—Freedom from Liming.
6—Freedom from Trouble.

5—Freedom from Liming

The solid matter that is ordinarily precipitated in the heating element of a water heater consists of lime and magnesia. Precipitation begins at a temperature of about 140 degrees. At a temperature of 180 degrees practically all of the solid matter is precipitated.

In order to prevent precipitation, the secret is, of course, perfect temperature control such as is realized in the EverHot. With the ordinary instantaneous heater, side arm storage heater or center flue heater with spreader, it is not only possible, but it is a common thing for the temperature of the water in the heating element to be far above the precipitation point while the water around the thermostat is below that point. This, of course, is not possible with an EverHot, for the reason that it has no restricted water ways. There is never, at any time, any water in an EverHot Heater that is more than five degrees above the temperature setting of the thermostat.

We have many thousands of EverHot Heaters in operation in hard water districts all over the United States. In some of these sections, the water is so hard that the ordinary water heater will not function for more than a few months without cleaning. Notwithstanding this, we have never had an EverHot Heater lime up to the point of becoming inoperative and some of them have been operating in the most difficult of hard water territories for better than four years.

Subjects 1, 2, 3, and 4 were treated in four previous issues of Heating and Ventilating Magazine. Subject No. 6 will be treated in the next issue.

Prices
Baby Grand $66 — Junior $88 — Senior $139

EverHot Heater Company

5215 WESSON AVENUE DETROIT, MICHIGAN
Canadian Distributor, Riley Engineering & Supply Company, Ltd., Toronto, Canada.

Ten minutes a year is all IDEAL Gas Boilers demand

LIGHT the pilot in the fall, turn it off again in the spring. That's all the time the IDEAL Gas Boiler demands from the owner.

Is it any wonder that more and more home owners are constantly turning to IDEAL Gas Boilers for comfort and convenience?

It may be true that cost of fuel per heating month is somewhat lower for coal-fired boilers, but such "savings" are bought with smudgy houses, dirty hands and tired backs. Coal and ashes take a *cash* toll, too, when the painter, the upholsterer and the dry cleaner come around in the spring.

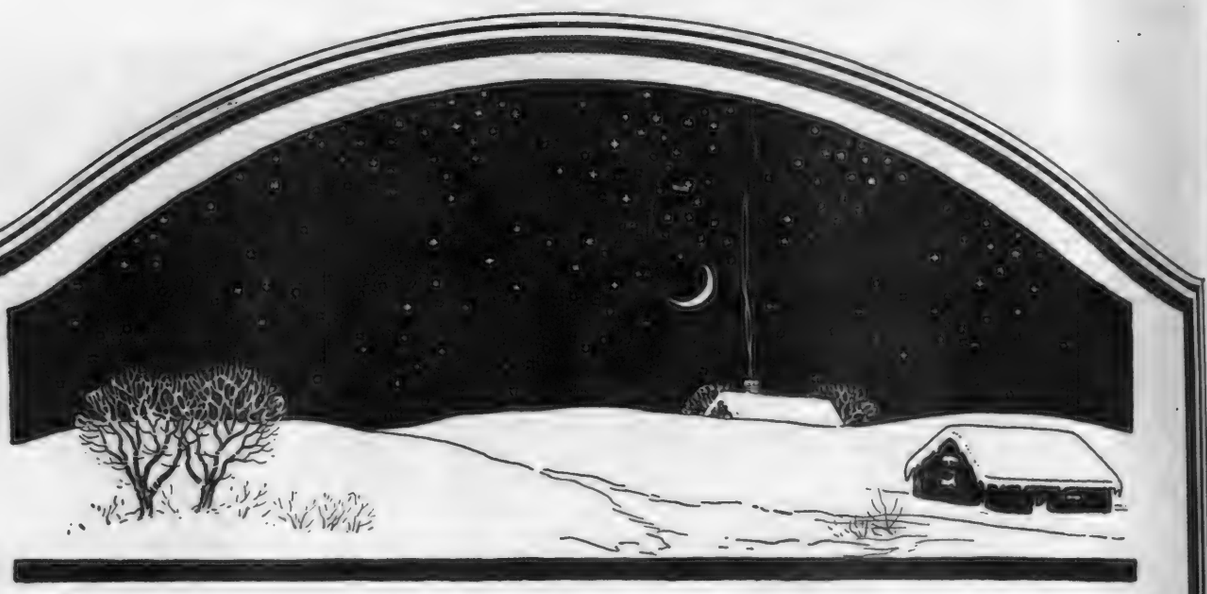
Heat with gas offers large returns on sales effort. We are selling the Architects and better Heating Contractors on IDEAL Gas Boilers *and your service,* using their leading technical journals. Write for our complete data and sales plan. Follow through.

AGA Code is the basis of rating and test for all IDEAL Gas Boilers. Rated size required, therefore, is only 25% in excess of total condensing load (including piping).

THE A. H. WOLFF GAS RADIATOR COMPANY

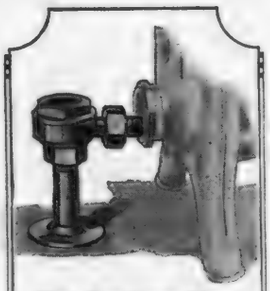
Distributors American Radiator Company's IDEAL Gas Boilers

376 Lafayette Street Dept. G 64 New York City



SILENCE

Noise in a heating system is as much out of place as is unreliability, and there is no good reason why either should be present. The Dunham System is as silent as the countryside in winter, at midnight.



The Dunham Thermostatic Radiator Trap

The silent, efficient watchdog of the coal pile.

The Dunham Packless Radiator Valve

A fitting companion to the Dunham Trap is the Dunham Packless Radiator Valve.

TO provide an absolutely quiet heating system it is necessary to remove the water of condensation from the radiators, and at the same time get rid of the imprisoned air. This was accomplished for the first time more than two decades ago through the invention of the Dunham Thermostatic Radiator Trap.

In the **silent** Dunham System the steam is allowed a free entry at one end of the radiator, while the water and air are released from the other through the automatic thermostatic trap.

Silence, in the Dunham System, is the by-product of free and unrestricted circulation of steam. There is nothing to impede either the flow of steam from the boiler to the radiator or the return of the condensate to the boiler, nor the release of the imprisoned air to the atmosphere. Consequently, in a Dunham System the radiators are efficiently heated, they are never noisy, they are not disfigured with air valves.

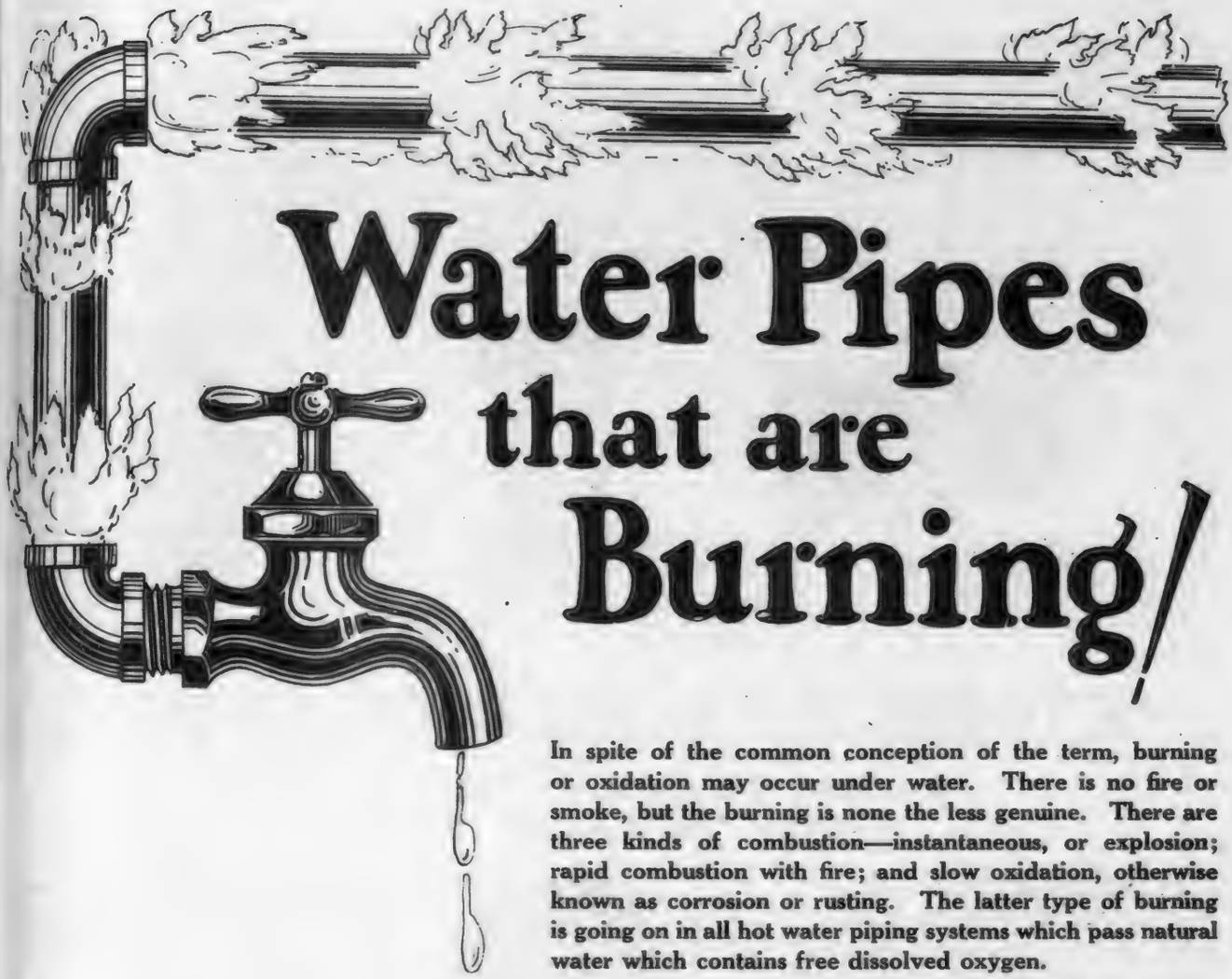
Silence in a heating system is not always expected, but it is always welcome. It is a vital and important part of Dunham Heating and is an index of the carefulness of Dunham design.

Over sixty branch and local sales offices in the United States and Canada bring Dunham Heating Service as close to your office as your telephone. Consult your telephone directory for the address of our office in your city.

C. A. DUNHAM CO.

230 East Ohio Street - - CHICAGO

The DUNHAM REG. TRADE MARK HEATING SERVICE



Water Pipes that are Burning!

In spite of the common conception of the term, burning or oxidation may occur under water. There is no fire or smoke, but the burning is none the less genuine. There are three kinds of combustion—instantaneous, or explosion; rapid combustion with fire; and slow oxidation, otherwise known as corrosion or rusting. The latter type of burning is going on in all hot water piping systems which pass natural water which contains free dissolved oxygen.

The dissolved oxygen in the water will oxidate the pipe metal regardless of the material of which it is composed. Rusting is familiar to all in connection with iron and steel pipes. It is not so commonly known that brass and copper pipe will dezincify, corrode, and fail from the same cause.

Removing dissolved oxygen and other gases from the water makes corrosion impossible. The removal may be accomplished by an Elliott Deaerator or Deactivator. These units are in service in many well known buildings, where they not only are preventing further corrosion but are working out of the system corrosion products which have accumulated during the years.

ELLIOTT DEAERATORS

eliminate
corrosion troubles
in piping systems

Ask for the full details.

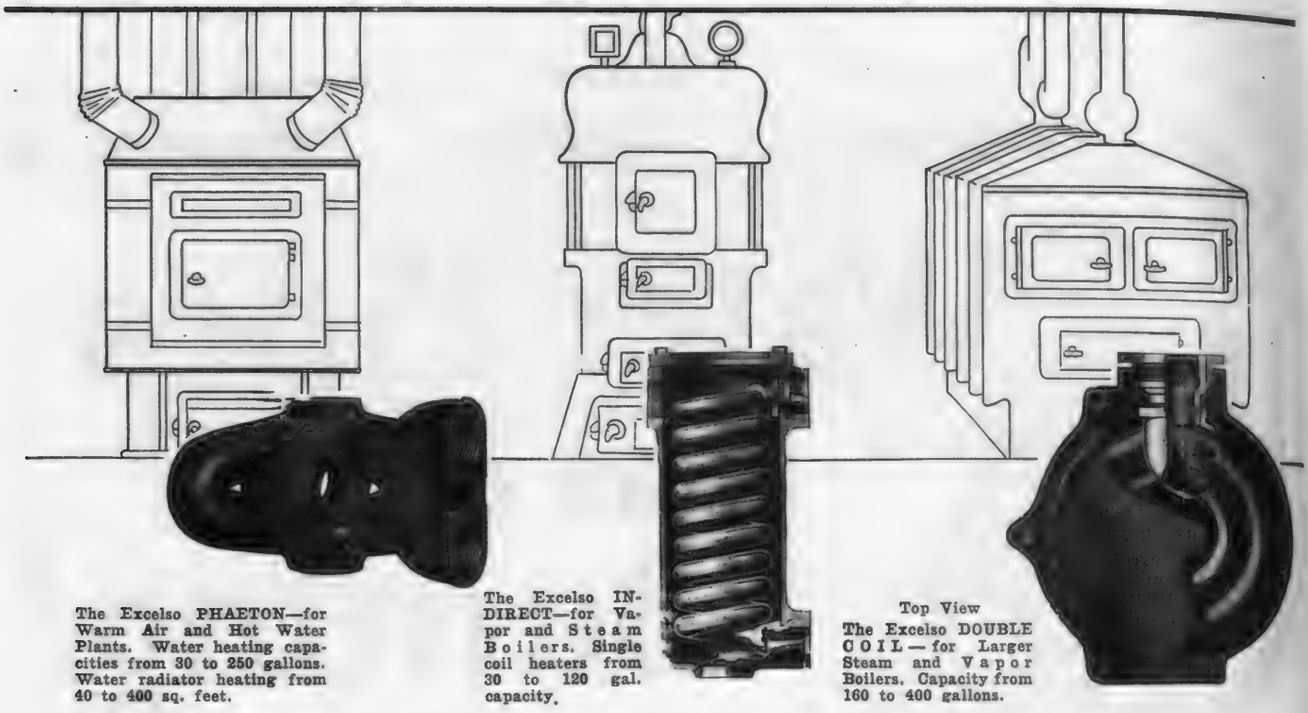
ELLIOTT COMPANY

Pittsburgh, Pa.

General Sales Offices: Jeannette, Pa.

District Sales and Service Offices: Atlanta, Baltimore, Boston, Cincinnati, Cleveland, Chicago, Detroit, Kansas City, New York City, Philadelphia, Pittsburgh, and St. Louis

N-839



The Excelso PHAETON—for Warm Air and Hot Water Plants. Water heating capacities from 30 to 250 gallons. Water radiator heating from 40 to 400 sq. feet.

The Excelso INDIRECT—for Vapor and Steam Boilers. Single coil heaters from 30 to 120 gal. capacity.

Top View
The Excelso DOUBLE COIL—for Larger Steam and Vapor Boilers. Capacity from 160 to 400 gallons.

OCTOBER DAYS ARE EXCELSO DAYS

Suggest the Excelso Now and All During the Heating Season

EXCELSO PHAETON, the efficient direct heater, for warm air and hot water plants — recommended in place of pipe coils which become clogged and burnt out.

EXCELSO SINGLE COIL INDIRECT for steam or vapor plants—30 to 120 gals. capacity. For homes and small buildings of all types. The original indirect heater, with copper coil and patented ground joint connection—over 300,000 in use.

Top View
Triple Coil
Capacities
600 and 800
gallons

EXCELSO DOUBLE COIL INDIRECT from 160 to 400 gals. capacity. For large homes and medium size buildings.

EXCELSO TRIPLE COIL INDIRECT, 600 to 800 gals. capacity. For larger buildings such as apartment houses, hospitals, office buildings, etc. May be connected in batteries for still larger requirements.

Write us direct for full information as to sizes for any type of home or building and connection to any kind of heating plant.

EXCELSO SPECIALTY WORKS, INC., 117 Clinton St., Buffalo, N. Y.

210 East 45th St.
New York

46 Cornhill
Boston, Mass.

5939 Haverford Ave.,
Philadelphia, Pa.

NATIONALLY DISTRIBUTED BY LEADING JOBBERS AND BOILER AND RADIATOR MANUFACTURERS

EXCELSO WATER HEATERS

Sold by All Plumbers and Steamfitters

TRADE O-E MARK

From the Smallest To the Tallest Everywhere ~

MORE HEAT - LESS FUEL

with TRADE O-E MARK 3-in-1 Heating System

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New York	Nashville
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NO. 1 SERIES OF O-E COAST TO COAST INSTALLATIONS

The size or type of building does not interfere with the successful operation of an O-E SYSTEM OF HEATING.

In the smallest to the tallest the country over you will find O-E performing satisfactorily and economically.

Three Systems in One—VAPOR, VACUUM, PRESSURE.

Present unsatisfactory Hot Water or Steam jobs may be converted into O-E at nominal cost.

Send for interesting data.

O-E SPECIALTY MFG. CO.

8-10-12 KEEFE AVE. MILWAUKEE, U. S. A.

Service and Permanence

were the ideals aimed for in the erection of the Postum Office Building. It will be significant to those who decide upon the piping requirements for similar installations that the major requirements of this building were met with "NATIONAL"—The Recognized Standard of Wrought Pipe. "NATIONAL" Bulletin No. 25 contains useful data on pipe for building purposes. A copy will be sent upon request.

NATIONAL TUBE COMPANY, PITTSBURGH, PA.

DISTRICT SALES OFFICES IN THE LARGER CITIES

No Part of a Heating System is More Important than the Trap

1
BODY AND CAP heavy bronze castings with metal to metal joints, heavily nickeled with polished trimmings.

2
THERMAL MEMBER is special composition brass, heat treated and filled with volatile liquid which expands and contracts according to temperature closing or opening the valve.

3
BALL VALVE and sharp edge seat made from best steam brass insures positive seating.

4
BRASS SEAT with extra large valve opening prevents dirt accumulation. Seats are renewable.

No. 6 Multiflex-Traps

The No. 6 Multiflex-Trap is a thermostatic return valve which allows the passage of air and water of condensation, automatically and noiselessly, without escape of steam, into the return piping. Positive seating is accomplished by the ball valve and sharp-edged seat used, and which insures against the escape of steam.

The No. 6 Multiflex-Trap is supplied in 3 sizes and numerous patterns. Each type is fitted with a Multiflex Thermal Member made from a special composition brass, corrugated into six folds, or corrugations, having 12 flexing surfaces. This distributes the deflection equally over all the surfaces.

The thermal member is filled with a volatile liquid, hermetically sealed under twenty-two inches vacuum and individually tested. Steam in contact with the thermal member vaporizes the volatile liquid, in turn expands and closes the trap preventing the escape of steam; air and water of condensation cools the thermal member, and the trap opens, permitting both air and water of condensation to pass, and again closes. Thorough drainage and air elimination are assured with positively the highest efficiency.

The PERFORMANCE of the No. 6 Multiflex Trap on various types of service is as follows, based on square feet of Radiating Surface.

Size and No.	Direct Radiation		Direct Indirect Radiators		Indirect Radiators		Coil or Wall Radiators	
	Vacu Vapor	Return Line	Vacu Vapor	Return Line	Vacu Vapor	Return Line	Vacu Vapor	Return Line
½"–6	101–150	126–200	71–100	81–140	61– 90	76–120	81–120	101–160
¾"–6	151–400	201–500	101–260	141–340	91–230	121–280	121–320	161–400
1"–6	401–800	501–1000	261–550	311–680	231–400	281–600	321–640	401–800

THE BISHOP & BABCOCK MFG. CO.
General Offices and Factories: CLEVELAND, OHIO
Offices in Principal Cities

BISHOP & BABCOCK
HEATING SPECIALTIES

Sterlco
TRADE-MARK

TYPE B

WHY

waste coal to overheat buildings?
live in overheated rooms?
pay exorbitant prices for temperature regulation when the

STERLCO-ROYS THERMOTROL

will control room temperatures accurately and can be installed at an exceptional moderate cost?

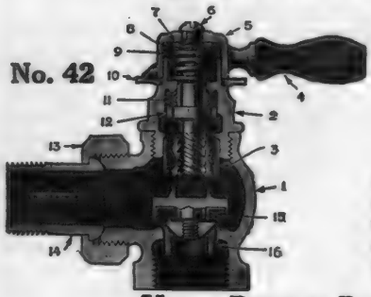
Write for Bulletin No. 38.

STERLING ENGINEERING COMPANY

1626-1644 Holton Street, MILWAUKEE, WIS.

REPRESENTATIVES IN ALL LARGE CITIES

McALEAR SPECIALTIES FOR VAPOR HEATING SYSTEM



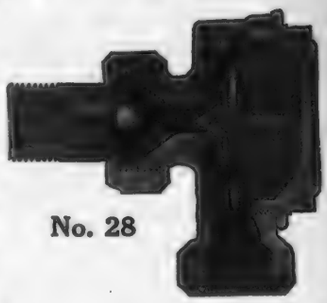
No. 42

Packless Radiator Valves

Quick-opening, nickel-plated brass body. Fig. 38, angle pattern, wood wheel handle; Fig. 42, angle pattern, graduating type, lever handle.

Radiator Traps

Discharge air and water in large quantities. Close tight against steam. Noiseless in operation. Nos. 28 and 28-A of steam metal, furnished N. P. unless otherwise specified. Nos. 28-A and 29-A have right and left-hand discharge openings. Nos. 29, 29-A, 33, 34 and 36 have iron bodies and brass caps, furnished plain unless otherwise specified.



No. 28

Vapor Damper Regulators

No. 58

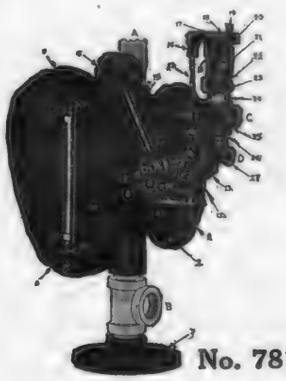
All metal, tapped for 1-inch steam pipe connection. Shipped complete with lever and two weights, S hooks, 2 ceiling pulleys and 12 feet of No. 10 plumbers' chain.

No. 56 for 0 to 3 pounds pressure, constructed with bellows of 10-inch flexible walls. No. 58 for 1 to 15 pounds pressure, constructed with bellows of 6-inch flexible walls.

Combination Float and Thermostatic Ball Check Valves

For venting supply and return mains of heating systems. These air valves close tight against water and steam, and by use of the check prevent the atmospheric pressure from entering the discharge opening.

No. 15



No. 781

Air Eliminator and Return Traps

For automatically returning the water of condensation direct to boiler and discharging air. Minimum distance between water line of boiler and bottom of trap should be 18 inches. "A"—inlet to trap; "B"—discharge to boiler; "C"—steam connection to boiler; "D"—air vent.

THE McALEAR MFG. CO.

1901-7 S. Western Ave.
CHICAGO, ILL.

—in these new apartments!

HUNDREDS, thousands of rooms—and in every room a personality to be reckoned with! . . . There is no type of building in the world that demands the same precision in heating control as the modern hotel and apartment. We illustrate here a few of the newer hotels and apartment buildings—all equipped with Webster Type "R" Modulation Systems of Steam Heating, backed up by Webster service.

What is Webster service? . . . It is a measure of responsibility. It begins with the architect and engineer in the preliminary planning stage and stays on the job during the entire life of the building . . . Before the plans for your next building are too far advanced, let us tell you more about Webster service and what it means to architects, engineers and heating contractors—and let us give you the facts on the Webster Type "R" Modulation System.

Webster Type "R" Modulation Systems of Steam Heating used in these buildings

1. Apartment House, Broadway, 82d to 83d Street, New York City. Mr. Emory Roth, Architect. Messrs. Wolff & Munier, Inc., Engineers and Contractors.

2. The Gilford, Lexington Avenue at 46th Street, New York City. Mr. Emory Roth, Architect. Messrs. Jaros & Baum, Engineers. Jarcho Brothers, Heating Contractors.

3. 15 Park Avenue Apartments, New York City. Frederick F. French Company, Architects. Mr. F. T. N. Bacon, Engineer. S. H. Sweeney, Heating Contractor.

4. The Randolph, 131 East 50th Street, New York City. Mr. Emory Roth, Architect. Messrs. Jaros & Baum, Engineers. Messrs. Wolff & Munier, Inc., Heating Contractors.

Warren Webster & Company

Pioneers of the Vacuum System of Steam Heating

Camden, N. J. **50 Branch Offices**

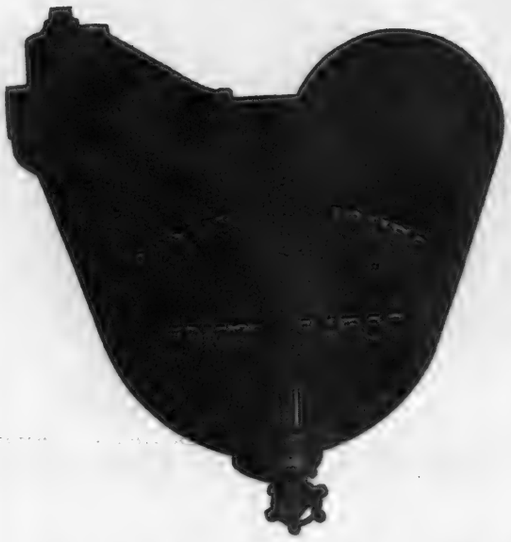
In Canada, Darling Bros., Ltd., Montreal

- since 1888

Webster Systems of Steam Heating

More than 34,000 installations in America's finer buildings

BOILER INSURANCE *for* VAPOR HEATING SYSTEMS



ONE of the greatest difficulties that has been encountered in connection with vapor or open return line systems of heating has been that of insuring the positive return of the water of condensation to the boiler at all times.

Years ago our experience convinced us that there was but one way to solve this problem of varying boiler pressures and that was by installing a receiving tank to which all water of condensation would be returned and in which the pressure would be automatically equalized with that of the boiler, the water then flowing back to the boiler by gravity.

Barnes & Jones Condensator

Keeping before us the many requirements to be met, we perfected the Barnes & Jones Condensator for use with the Barnes & Jones System of Vapor Heating, which we believe to be the most efficient apparatus on the market for the purpose for which it was designed.

The Condensator is simple in construction, but its operation is positive at all times. It has few movable parts and all movable parts are wholly enclosed so as to prevent their being tampered with. All working parts are constructed of the best bronze metal.

The fundamental purpose of the Barnes & Jones Condensator is to return the water of condensation to the boiler from open return line systems independently of the boiler pressure. It should be understood clearly that this is accomplished without any change in the operating conditions of the system, and without air-binding the system, or admitting steam to the return side.

Insurance in all B. & J. Appliances

The same careful engineering thought and investigation that entered into the development of the Barnes & Jones Condensator has entered into the design and development of every Barnes & Jones appliance, and the same careful consideration is given to every Barnes & Jones installation to insure the most efficient results possible.

Barnes & Jones

Vapor and Vacuum Heating Systems of Proven Quality

300 Madison Ave.
New York, N. Y.

5 Melrose Street
Boston, Massachusetts

HANDON

A FEW REASONS
WHY HANDON CHARCOAL IRON BOILER AND TANK HEATER SALES ARE INCREASING

1—There is no BETTER BOILER sold ANYWHERE at ANY PRICE.

2—A BETTER casting. Made of CHARCOAL IRON.

3—FULL grate area.

4—MORE prime heating surface.

5—Steams QUICKLY and RETAINS heat.

6—Long fire travel.

7—EXCELLENT SERVICE.

8—MADE RIGHT by expert foundry men.

9—Gives COMPLETE satisfaction.

10—The customer COMES BACK for more.

Send for catalogue and discount sheet to

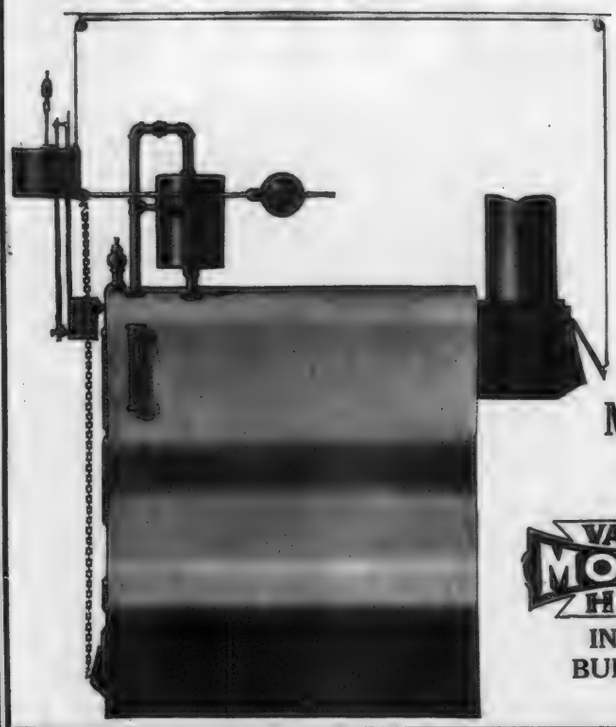
HANDON BOILER CORPORATION

General Office and Salesroom

101 Park Avenue, New York, N. Y.

HANDON

The Mouat System of Heating Operates on 1 to 2 oz. Pressure



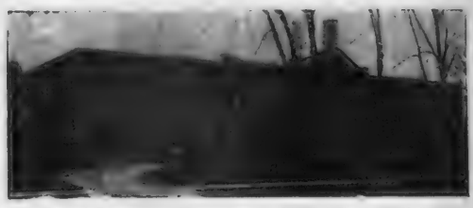
The Mouat System of Heating, a two-pipe gravity vapor or atmospheric steam heating system, operates at from 1 to 2 ounces pressure. No pumps, thermostatic valves, return traps or mechanically operated parts.

This extremely low pressure is maintained by the Mouat Damper Regulator, sufficiently sensitive to operate at a variation of less than one ounce. This regulator is not affected by high, low, or unsteady waterline, since the working parts are connected above the waterline of the boiler. No water can be forced out of the boiler through the regulator.

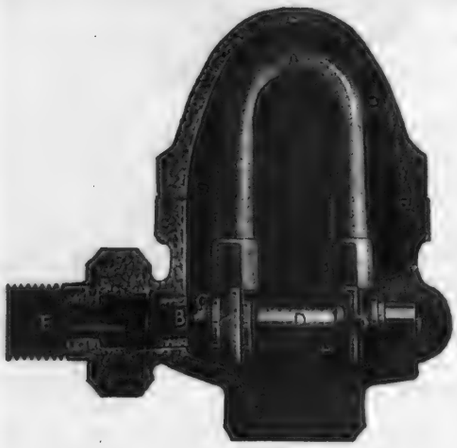
This regulator can also be used to reduce steam pressure to vapor pressure on central station heating plants.

MOUAT VAPOR HEATING COMPANY
CLEVELAND, OHIO

VAPOR MOUAT HEAT
IN THIS BUILDING



Good Samaritan Hospital, Vincennes, Indiana



The Perfect Automatic Valve for Vacuum or Vapor Heating

The "Vento" Automatic Valve represents a steady improvement in the Haines line of steam traps and offers the highest degree of steam trap efficiency.

There has been no change in the old reliable principle that has placed Haines Automatic Valve in a class by itself. The operating power is identical—the only difference being in the general construction.

Special features are: Horizontal mounting of valve mechanism—long range of movement—positive action—quick opening and closing.

"VENTO" Advantages

System starts with valve wide open, assuring circulation almost the instant steam is turned on.

Control of valve opening from two to eight times larger than other makes of valves.

Size of valve opening reduces danger of fouling with scale or other foreign matter.

Closes absolutely tight against steam. No necessity for use of spray water at pump.

Cannot stick or gum from foreign matter, and operation is absolutely noiseless.

Send for booklet

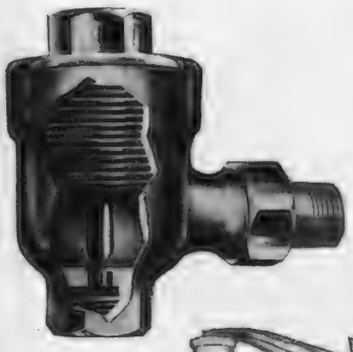
WILLIAM S. HAINES & CO.
12th & Buttonwood Streets
PHILADELPHIA, - - PA.

VENTO

UNDIVIDED RESPONSIBILITY

BELLOWS PACKLESS VALVE+BELLOWS RADIATOR TRAP+VACUUM PUMP

The "Big Three" are backed by Trane
USE THEM TOGETHER

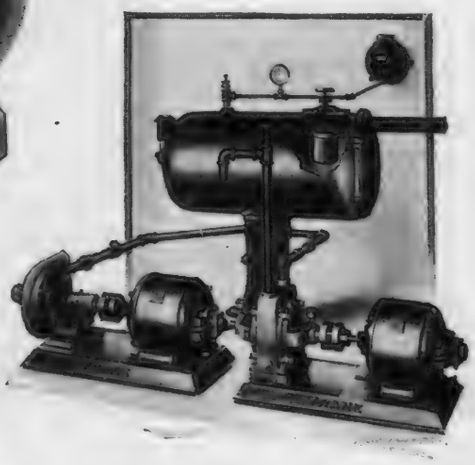


Trane Bellows Trap 14 corrugations. Bellows 1¾ inch in diameter. Brass body. Normal range 15-inch vacuum to 25 pounds pressure. Guaranteed 5 years. Described in Bulletin 14.

Trane Bellows Packless Valve Absolutely packless in every respect. Contains genuine Trane Bellows. Brass body. Indestructible handle. Described in Bulletin 14.

Trane Vacuum Pump Separate Case Construction. Single or two-motor drive. 350 combinations. Pedestal type tank with built-in strainer. Less motor horsepower for a guaranteed capacity than any other vacuum pump ever designed. Described in Bulletin 20.

Write for the Trane Bulletin Binder, describing the entire line of Trane Heating Specialties and Trane Pumping Equipment.



HEATING TRANE PRODUCTS PUMPING

THE TRANE COMPANY, 206 Cameron Ave., La Crosse, Wis. Manufacturers of vapor and vacuum heating specialties and pumps. Branches and sales connections at New York, Chicago, Boston, Philadelphia, Buffalo, Cleveland, Detroit, Seattle, Los Angeles, Albany, Minneapolis, Salt Lake City, Ft. Wayne, Portland, Ore., Greensboro, N. C., Zanesville, Ohio, Atlanta, Ga., Des Moines, Ia. In England: 22-23 Clerkenwell Close, London, E. C. 1. In Canada: The Trane Co., 23 River St., Toronto; Thomas Robertson & Co., 134 Craig St., West, Montreal; F. S. Murdoch, 310 Breadalbane, Winnipeg. In Japan: The Uchida Trading Co., Ltd., Tokio—Osaka—Kobe. In China: C. J. Doughty & Co., 7 Jinkee Road, Shanghai.

89 million advertisements like these

Have you a cold radiator
try this your cold radiator
When a radiator won't get HOT
TRY THIS
have you a cold room
To make a cold radiator HOT
to people with cold radiators
AIRID
AIR VALVES
make cold radiators HOT

These magazines will carry AIRID advertisements all through the heating season

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Literary Digest
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Good Housekeeping
Popular Mechanics
Popular Science Monthly
Better Homes & Gardens
House Beautiful
House & Garden

will make a lot of people want

AIRID
Air Valves

AMERICAN RADIATOR

1807 Elmwood Avenue Dept. S Buffalo, N. Y.

Dress your window like this

then owners will come to your shop for AIRID Air Valves

How to get your AIRID window display

THE illustration above is a typical shop window. The Airid window display includes the Airid cutout (showing a life-size radiator and an actual Airid Valve), the three posters and three dozen Airids in self-selling display boxes.

Ask the American Radiator Company salesman to send you, free, the cutout and the posters. Then, with a display like this you will attract your share of Airid business and have Airids in stock for owners who call.

COMPANY

IDEAL BOILERS, AMERICAN RADIATORS
ARCO VALVES AND REGULATORS

"—like driving an automobile by spurts and stops"

TWO kinds of control are obtained with thermostats used to regulate room temperatures; they are:

1. Positive, Snap-Action Control
2. GRADUAL Control

Which kind of control gives the most ACCURATE regulation? This question is answered in an able manner by N. W. Calvert and J. E. Seiter, in a paper published in the January, 1924, issue of the "Journal of American Society of Heating and Ventilating Engineers," in which they make the following statements:

". . . with individual thermostat control using the 'positive type' thermostat in which the controlled valve is either wide open or tightly closed, perfect regulation is difficult.

"When the temperature of the room reaches that set on the thermostat, the valve on the radiator closes. This radiator is still full of steam and the large weight of metal in the radiator itself is at a temperature between 212 and 230 degrees Fahr., and continues to radiate heat to the room. The occupant, becoming too warm, opens the window, thus cooling off the room sufficiently to cause the thermostat to open the radiator valve again.

The Powers Type K Thermostat

"An intermediate (gradual) type thermostat, which will open the radiator valve only to a degree required by the need for heat in the room, is much to be preferred."

To operate heat controlling valves or dampers *wide open* and completely closed is obviously wrong. It is like driving an automobile by spurts and stops, alternately turning on and shutting off all of the power.

Only the Powers System Gives True GRADUAL Control

Only the Powers System of temperature control obtains true GRADUATED action, holding valves or dampers sufficiently open so that the necessary heat is steadily delivered to maintain the correct temperature.

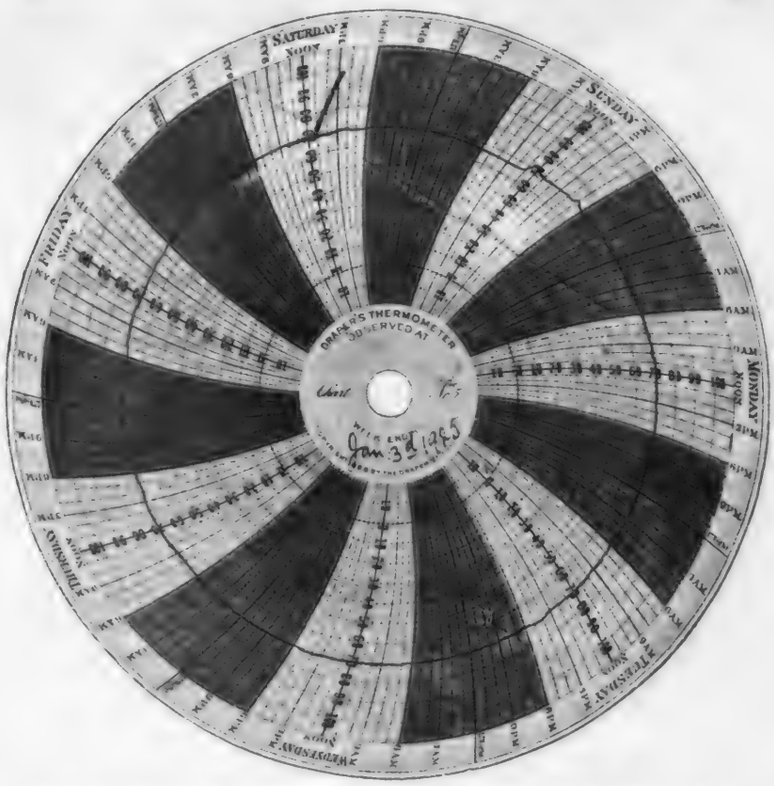
In the Powers Thermostat the powerful Vapor Disc operates a double valve—controlling both supply and exhaust of the compressed air, thus acting as a reducing valve, giving just the air pressure required to correctly position the heat controlling valves and dampers.

Both the exhaust and supply cannot be open at one time—there is no continuous air waste. The valve or damper is positioned, then the air consumption

ceases until further change is required. Excessive use of air introduces large quantities of dust and moisture into a system with resulting clogging, and corrosion of air lines and mechanism. As the Powers System uses only five to ten per cent of the air required by other systems, it often gives ACCURATE and DEPENDABLE control for 15 to 25 years with practically no expense for adjustments or repairs.

Our book THE ELIMINATION OF HEAT WASTE shows why Powers control gives the most Accurate and Dependable service money can buy. May we send you a copy?

NOTE—Drop in temperature from Saturday to Sunday noon due to use of exhaust steam. Balance of time live steam was used.



Results Obtained with Powers GRADUAL Control

This chart came from the Barbour Flax Spinning Company. It records the temperature maintained by the Powers System of Automatic Temperature Control in the workrooms at their plant at Kearney, N. J. We shall be glad to work with engineers who want results like this for their clients.

THE POWERS REGULATOR COMPANY

34 years of specialization in temperature control

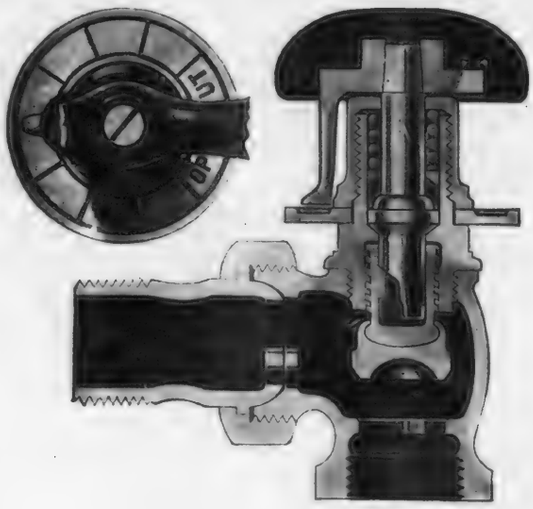
2718 Greenview Ave., Chicago

Atlanta, Baltimore, Boston, Buffalo, Butte, Mont., Charlotte, N. C., Cincinnati, Cleveland, Denver, Des Moines, Detroit, El Paso, Houston, Indianapolis, Kansas City, Los Angeles, Milwaukee, Minneapolis, Nashville, New Orleans, New York, Philadelphia, Pittsburgh, Rochester, St. Louis, San Francisco, Seattle

CANADIAN OFFICES

Toronto, Montreal, Halifax, Winnipeg, Calgary, Vancouver

Something Entirely New in Water Heat Regulation



Packless Feature

Graduated Fig. 139

We have made a special study of hot water heat regulation and control and are pioneers in the matter of individual radiator control, through a graduated valve, employing the same principle as with steam. If you can modulate, graduate, or regulate individual radiator vapor or vacuum steam heat through a valve (and you can), then why not by the same principle regulate water heat.

For Sleeping Rooms, heat regulation with the **Marsh Graduated** water valves may be controlled with the **same ease of operation and certainty of results** as is possible with a Modulated valve on a steam system, and **at a much less cost than for a vapor or vacuum system installation.**

Further, water circulation for each radiator, graduating for same or **balancing of system,** can be increased from nothing to full pipe capacity and **held or locked at any intermediate point,** if desired, by simply turning dial so that stop on same will register against indicator or pointer and locking dial in this position, preventing further opening of valve or turning of wheel or lever handle to the left.

These valves cost but little more than our regular water valves and **much less than steam modulated valves.**

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It is the most efficient apparatus of its kind because it:

Will not clog, requires only nominal water pressure, requires less power to operate, provides exact and positive control of air condition at all times.

Let us send you Bulletin No. 25, telling why this is so.

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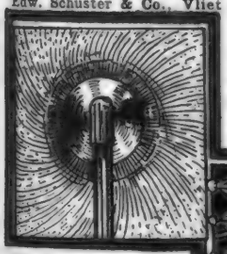
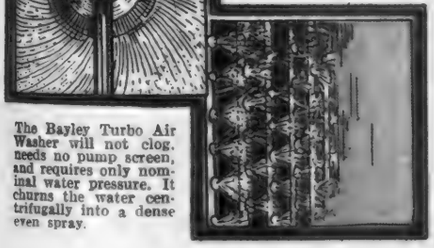


The high pressure, multiple nozzle air washer, requires water at high pressure screened at the pump and the fine orifice nozzles easily become clogged.



The Bayley Turbo Air Washer will not clog, needs no pump screen, and requires only nominal water pressure. It churns the water centrifugally into a dense even spray.

Bayley

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HEATING AND VENTILATING
AIR WASHING AND HUMIDIFYING SYSTEMS
MILL EXHAUSTERS—PRESSURE BLOWERS
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but merely a continuance of our policy of supplying to the trade the best valve possible to manufacture.

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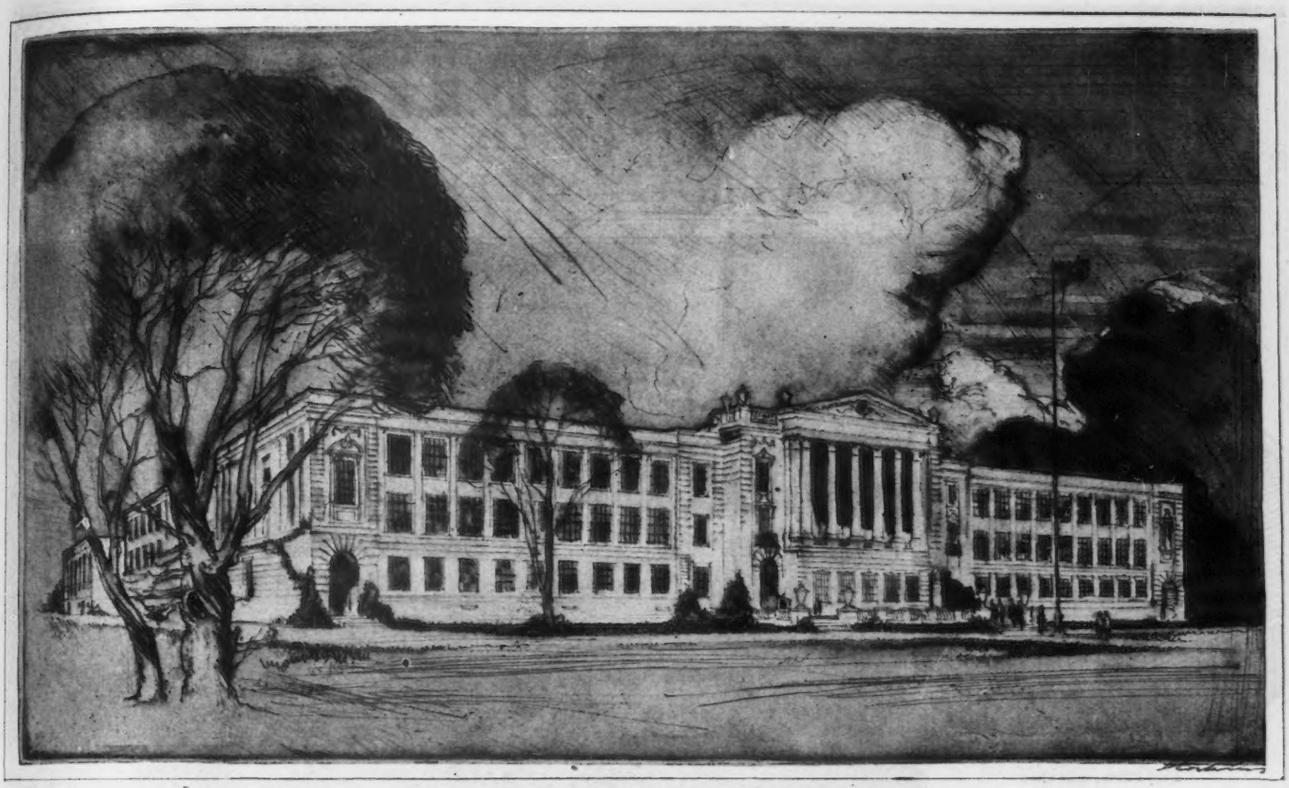
The use of a high grade product is economy — "Milwaukee" Valves are high grade and economical.

MILWAUKEE VALVE CO.

MILWAUKEE, WISCONSIN, U. S. A.



WARREN G. HARDING SCHOOL, WARREN, OHIO—UNIVENT SYSTEM BEING INSTALLED—KEICH-O'BRIEN & HOSKER, WARREN, OHIO ARCHITECTS—H. M. NOBIS, ENGINEER—T. M. SHAND, CONTRACTOR, CLEVELAND, OHIO

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HEGGIE-SIMPLEX

[FORMERLY SIMPLEX]

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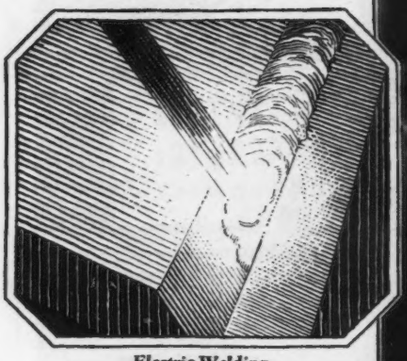

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The Heating and Ventilating Magazine

VOL. XXII Reg. U. S. Pat. Off. Reg. Canadian Pat. and Copr't Off. No. 10

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REGULAR features of THE HEATING AND VENTILATING MAGAZINE include weather records (during the heating season) for five representative American cities, a monthly quartet of data sheets, a series of articles on present accepted types of oil burners, another on recent significant developments in the gas heating field—both manufactured and natural—together with one lesson each month of a carefully-prepared Home-Study Course in Gravity Steam and Water Heating.

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